

“Grand Canyon is our home. Uranium mining has no place here”

Editorial by Carletta Tilousi, member of the Havasupai tribal council.

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The Havasupai – “people of the blue-green waters” – live in Supai Village, located at the bottom of the Grand Canyon. Today our lives and water are being threatened by international uranium mining companies because the US government and its 1872 mining law permit uranium mining on federal lands that surround the Grand Canyon.

In 1986, the Kaibab national forest authorized a Canadian-based uranium company to open Canyon mine, a uranium mine near the south rim of Grand Canyon national park. The Havasupai tribe challenged the decision but lost in the ninth circuit court of appeals. Miners were just starting to drill Canyon mine’s shaft in 1991 when falling uranium prices caused the company to shut it down for more than two decades.

Havasupai ancestors share stories of the sacredness of the Grand Canyon and all the mountains that surround it. They have instructed us to protect the waters and the mountains from any environmental contamination. That’s why we stand firm against any uranium mining in the Grand Canyon region.

As uranium prices began to rise again in 2007, the uranium company reopened three closed mines on lands managed by the Bureau of Land Management, north of the Grand Canyon. More than 10,000 new claims were also filed on those public lands and US Forest Service-administered lands on the south side, above where we live.

In 2009, the Havasupai gathered together hundreds of supporters at Red Butte to oppose the reopening of the nearby Canyon mine. Red Butte is the sacred lungs of our Grandmother Canyon. It is also important to many neighboring tribes. We joined in prayer and ceremony to stop the desecration.

The Havasupai tribe also filed a lawsuit against the Forest Service for failing to consult us and other tribes when it permitted Canyon mine to reopen. They did not consider new evidence of its potential to pollute our people’s sole source of drinking water or to harm Red Butte. We are anxiously awaiting a decision on our case that we argued before the ninth circuit court of appeals in December 2016.

Earlier this year, miners drilled Canyon mine’s shaft to a depth of 1,400ft. But before they could start mining and trucking uranium ore to the mill in Utah, millions of gallons of water needed to be pumped from the mine’s shaft after it was flooded with water from underground sources. The company reported that water in the mine’s containment pond had three times the level of uranium considered safe for human consumption.

During our gathering at Red Butte in 2009, we also prayed for federal agencies to use their authority to prohibit new uranium claims. Local governments that rely on tourism, supervisors of our own Coconino

County and business leaders joined with Arizona's governor in supporting a 20-year ban on new claims on more than a million acres of public land that surround the Grand Canyon.

In 2012, we celebrated the Obama administration's order that honored our request to stop thousands of unproven claims from going forward and to close the area to prospecting for uranium. Now, misguided politicians in Arizona's Mohave County are asking Donald Trump to overturn the decision because they claim they need uranium mining to help grow their economy. We oppose their request because we don't want them to pollute our blue-green waters.

Once again, our sacred water and lands are being attacked to profit other people. For this reason, the Havasupai people and citizens throughout the region have been gathering at Red Butte over the past two days to conduct prayer ceremonies and workshops, and to gain support and bring awareness to the poisonous legacy of uranium all around the Grand Canyon.

The Havasupai are resilient people. We have resided in and around the Grand Canyon for many centuries. This struggle is not about money to us, it is about human life.

Please stand with us to put an end to mining uranium in our home, which has always been the Grand Canyon.

Gathering to Halt Grand Canyon Uranium Mining

July 13, 2017 by Roger Clark, Grand Canyon Trust



The Havasupai Tribe recently hosted a gathering to oppose uranium mining in and around the Grand Canyon. They hope to halt Canyon Mine, a uranium mine located a few miles from the South Rim that threatens to contaminate their sole source of drinking water, and to protect their sacred homeland from an unconscionable sacrifice.

Tribal council member Coleen Kaska said: “The message that we’re trying to send is listen to us. Hear our voices. Hear the native people’s voices. Hear the Havasupai Tribe. We’re a small tribe but we have a big voice, we have a big area to protect, Grand Canyon area as our sacred religious territory and aboriginal lands. We are still here and wanting to protect our Mother Earth.”

In late June, a group of cultural leaders and young Havasupai men left their home in the bottom of the Grand Canyon to prepare a sweat lodge and ceremonial grounds on the western slope of Red Butte. The U.S. Forest service issued them a permit to use the national forest that now occupies their aboriginal land. Havasupai elders, grandchildren, and families arrived two days later — the first day of summer — and were soon joined by hundreds of relatives from neighboring tribes and native communities from as far away as Mexico and Canada.

Ceremony

For four consecutive days, [singers rose before dawn](#) to fill the basin beneath Red Butte with heart-pounding drum beats and prayerful songs.

Runners gathered under a still starlit sky to sprinkle water from their spring-fed Havasu Creek on top of Red Butte at sunrise. Many others gathered at the fire circle to pray and be smudged by smoldering sage before walking 3.6 miles in peaceful protest along the gravel road, which dead ends at Canyon Mine's security gate. Tarp-covered ore trucks may soon be hauling uranium from the mine through several native communities to the White Mesa Mill in southeast Utah.

Speakers, singers, and dancers filled afternoons and evenings under the cover of a 6,000-square-foot tent. Elders led round dances and shared stories about their long battle to stop uranium mining. Tribal members took turns at the sweat lodge and tending the ceremonial fire at the center of the prayer circle.

Political and cultural leaders from many neighboring nations testified of their resolve [to end uranium's deadly legacy](#) and spoke of their commitment to restore harmony to the land.

"The Havasupai are resilient people," wrote Havasupai Tribal Council member Carletta Tilousi in an [editorial](#). "We have resided in and around the Grand Canyon for many centuries. This struggle is not about money to us, it is about human life."

Red Butte and persistence

Red Butte is a resistant stack of silty sandstone that stands prominently near Grand Canyon National Park's busiest point of entry. While geologists date its deposition to the age of the dinosaurs, the Havasupai believe it to be the lungs of a living landscape, a place that is connected to the sky by surrounding peaks and to the sea by its scarce and sacred waters.

Early residents in the region placed stones pointing to where the sun sets on the summer solstice, and when followed in the opposite direction, to where the sun rises on the winter solstice. Precise tracking of changing seasons aided in gathering and growing enough food and securing sufficient water to survive in this drought-prone region, where people have been praying and persisting for millennia.

The prayer gathering coincided with this year's summer solstice. It began during a prolonged period of cloudless skies and excessive heat warnings. Officials from the Kaibab National Forest had put fire bans in place, but they made an exception for the tribe's ceremonial use of fire.

On the final afternoon, a soaking rain swept across the parched land and released the bittersweet scent of sage. Gathering members took this to mean that their prayers had been heard. Convinced of the power of ceremony on hallowed ground, Havasupai leaders are already planning for their next gathering at Red Butte.

“Our View: Be better prepared for new era of uranium mining”

By the Arizona Daily Sun Editorial Board

Published in the Arizona Daily Sun, October 15, 2017.

Now that he has recommended shrinking some national monuments, he'll turn his attention to reopening parts of the Grand Canyon watershed to uranium mining.

That's the thinking among industry and environmental groups now that Interior Secretary Ryan Zinke has finished his “listening” tour of monuments and made his recommendations to President Trump. It's a different era of deregulation and expanded private uses of public lands than under President Obama, even if the White House is still governing mainly by executive order.

The challenge for those who favor an extended time-out for new uranium mining pending more research is how to respond if the moratorium is lifted. Lawsuits can no doubt be filed to force the filing a new EIS to justify mining resumption. But our sense is that opponents ought to pick their spots and negotiate for highly restricted and monitored mine sites in exchange for areas of permanent withdrawal. After five years of research since the 2012 moratorium, scientists likely have at least a preliminary reading on the riskiest as well as the least risky locations. Better to lock those in subject to ongoing and better-funded research than risk a blanket resumption of mining over 1 million acres by walking away from the bargaining table.

USE MINE AS GUINEA PIG

But why participate in mining at all, given the toxic legacy of Cold War-era uranium mining on the Rez and elsewhere? For starters, there's already a grandfathered uranium mine south of Tusayan set to reopen by next year, regardless of the moratorium. Use it as a guinea pig for not only enhanced, 24-7 monitoring but mandatory shutdowns and immediate remediation when water gets in. And in the Legislature, Democrats should introduce bills with much tougher bonding and penalties for existing and new mines based on past violations, then force Republicans to vote against safer uranium mining and run on that record.

Another reason to engage is that, as we report today, the open pit and tunnel mining techniques of a half-century ago are long gone. Modern mines sink a shaft down alongside a vertical “pipe” of uranium ore – there's no injection of water and no direct exposure to air. The ore is hauled up and trucked away to a mill in Utah, not crushed or processed on site that releases toxic dust. It's not fracking and it's not leveling mountaintops, nor is there any plausible scenario by which the

Colorado River itself would be contaminated – its water volume would dilute any radioactivity below background levels.

MORE RESEARCH FUNDING

Instead, the risks have mainly to do with the pipes of underground ore being loosened by mining, then coming into contact with perched or even deep aquifers. The radioactive particles become soluble and travel potentially into seeps and springs. But at what levels of contamination and for how long it would persist are still subject to more research.

Scientists say they could answer those questions sooner if they had more funding to sink more test shafts and do tracer studies of underground water connections. State regulators don't have the money to even do regular on-site inspections, much less tests – the Canyon Mine near Tusayan does self-reporting, even of violations. So here's a thought: If the industry is so confident their mines are low-risk, let them post bonds and pay fees for monitoring and testing sufficient to prove it. Failing that, challenge Gov. Ducey, an opponent of the mining moratorium, to put enough money in the Department of Environment Quality budget to do all of the above. At the most, there are likely to be just a handful of new mines that open on his watch, not enough to break the state piggy bank.

Given the uncertainty of current research on contamination scenarios from modern mining, we'd urge the Trump White House to take a pass on disturbing the moratorium. But his track record says he'll be doing the opposite, which is why Grand Canyon advocates need to get up to speed on modern breccia pipe mining and come up with counter-proposals that contain the risks in exchange for protecting the most vulnerable seeps and springs. Stonewalling may be emotionally satisfying, but with thousands of claims already staked in the watershed and a mining advocate in the White House, it's not very practical if minimizing risk is what the moratorium was about in the first place.

“Grand Canyon is a national treasure, not a place for uranium mining”

Editorial by Robert Arnberger and Steve Martin (Former Superintendents of Grand Canyon National Park),
CNN, January 9, 2018

The Grand Canyon is a great natural treasure, one of the most recognizable and revered landscapes on earth. And yet, despite its universally beloved status, it is threatened by the Trump administration. A recently released [government report](#) reveals that President Donald Trump and his Cabinet are considering lifting the ban on uranium mining on the federally owned public lands that surround Grand Canyon National Park.

We are former superintendents of Grand Canyon National Park. We managed the park with pride for current and future generations of the American public -- the park's true owners. We are dismayed that the current administration is considering putting one of the most iconic places in our nation, indeed in the world, at risk of contamination from uranium mining. In December, the 9th US Circuit Court of Appeals [upheld](#) the Department of Interior's 2012 decision to bar new uranium mining on about a million acres of land around the Grand Canyon for 20 years. Although we applaud the court's decision, the Grand Canyon is still under threat, and the Trump administration's push for uranium mining poses a serious threat to our beloved public lands.

The court's ruling does not stop the Trump administration from trying to reverse the 2012 moratorium, as proposed in the [US Forest Service document](#) in November. Furthermore, the administration recently announced a new push for increased domestic mining of "[critical minerals](#)," which according to the President's executive order would likely encompass uranium.

[Almost 6 million](#) people from all over the world visited the Grand Canyon in 2016, making it one of the most sought-after parks for those in search of awe-inspiring landscapes, cultural history and solitude. The canyon is also a sustainable economic generator, with visitors generating [nearly \\$1 billion](#) a year for the local economy. All of that would be threatened if the Trump administration pushes to lift the 2012 moratorium.

The goal of the [2012 temporary ban](#) was simple -- protect the Grand Canyon and the millions of people in the Colorado River Basin that depend on the river for drinking water, irrigation and other uses.

The ban also allows researchers to study the potential consequences of uranium pollution and ensures that the waters and landscapes of the region are protected in the interim. Notably, the ban was [widely supported](#) by Native American tribes and communities adjacent to the park. It is a thoughtful and reasonable approach to carefully manage and protect the watershed around Grand Canyon National Park, and it also provides the opportunity to thoughtfully revisit the issue in 20 years.

Over the past few months, Secretary of the Interior Ryan Zinke has moved to increase drilling on public lands with little regard for the impact on the environment and local communities. In adherence to Zinke's recommendations, Trump [recently signed](#) two proclamations rescinding the national monument status of almost 80% of the Bears Ears National Monument and around 45% of the Grand-Staircase Escalante Monument.

While Zinke's motivations for seeking to reduce the monuments has hinged on curtailing "government overreach," in reality, Zinke's decision is deeply unpopular with the public: More than [98%](#) of all comments received during the Interior Department's 60-day comment period expressed support for maintaining or expanding national monuments. This lack of public support for the decision suggests that Zinke was more moved by politically expedient forces: [special interests](#) who want to drill and mine in the monuments and out-of-the-mainstream politicians such as Rep. Rob Bishop of Utah who [have been attacking](#) the Antiquities Act for years.

Secretary Zinke's attack on public lands continued the day after the monuments announcement, when the Interior Department released a final report detailing his recommendations for shrinking or changing management plans for other national monuments -- opening them up to "traditional uses," such as coal mining, oil drilling, and logging. To put it lightly, these proposals and decisions coming from Secretary Zinke and the administration are worrisome to those of us who have dedicated our lives to the protection of all these special places.

On May 6, 1903, President Theodore Roosevelt stood on the rim of the Grand Canyon and [delivered](#) one of his most famous speeches, "Leave it as it is. You cannot improve on it. The ages have been at work on it, and man can only mar it."

Secretary Zinke has endeavored to mold himself as a conservationist in Roosevelt's image, and even [has a bust](#) of the conservationist President in his office. Certainly, Roosevelt, armed with concerns about uranium mining, would have decided in favor of protecting the Grand Canyon.

Will Trump Dump on Grand Canyon? Experts Say Risk of Uranium Mining Not Worth Reward

[MIRIAM WASSER](#) | JANUARY 11, 2018 | PHOENIX NEW TIMES

If you didn't know what you were looking for, you'd probably never come across Canyon Mine, an active uranium mine near the South Rim of the Grand Canyon. To get there, you turn off Highway 64, about 11 miles before the South Ranger Station entrance, and follow Forest Service Road 305 through a forest of ponderosa pine, pinyon, and juniper trees.

After five miles, the bumpy unpaved road ends at a metal fence with a few security cameras and "no trespassing" signs mounted on it. Canyon Mine, which is owned and operated by Energy Fuels Resources, isn't particularly impressive from the outside. Aside from the tall green headframe, there's a squat building, a few trucks, some rock piles, and a large black plastic-lined storage pool filled with water.

Unlike the big, hellish-looking open pit coal mines of Appalachia, uranium mines tend to leave a much smaller physical imprint on the surface of the earth. In fact, there's a good chance that if you were visiting the Grand Canyon during the mine's extraction phase, which is expected to start in the next few years, you'd never know anything was happening.

But Canyon Mine is just one mine. What if there were hundreds of them in the area?

For the last few years, that's been a moot question. In 2012, President Barack Obama's administration put a 20-year freeze (called a mineral withdrawal) on all new mining claims in 1 million acres around the Grand Canyon. A handful of mines with valid existing rights, like Canyon Mine, were grandfathered in and permitted to move ahead with operations.

The reason for the withdrawal was simple: Scientists didn't know enough about the complex hydrology of the area to say whether mining could cause irreparable damage. And with the entire Grand Canyon ecosystem and tourism industry at stake — not to mention the Havasupai who live in the park and the millions of people who live downstream from the Colorado River — there was overwhelming public support for the decision.

Fast-forward to the present day, however, and there are signs that the moratorium may not survive Donald Trump's presidency.

His administration has spent the last year systematically trying to undermine his predecessor's environmental policies, an agenda that has included reducing regulations and opening up vast areas of public land for mining, drilling, and fracking.

In the case of uranium, "they're just doing it because they can," says Chris Mehl of Headwaters Economics, an independent nonprofit research group that studies western land management. "They're offering an opportunity for a product that is at or near historic low prices."

(For anyone inclined to bring up the debunked Uranium One "scandal" at this point, just know that lifting the moratorium has nothing to do with Hillary Clinton and the Russians.)

As any economist will tell you, sometimes it's worth taking a big risk in order to get a big reward. But when it comes to reversing the 2012 withdrawal, the potential benefits seem small and the risks seem huge.

Much has been written about the health and environmental hazards posed by uranium mining near the Grand Canyon; what's missing is the economic side of the story.

For years, *Phoenix New Times* has heard that uranium mining in the area is not only environmentally irresponsible, but makes no economic sense. These critics include scientists, conservationists, local politicians, and even leaders in the nuclear power industry. They say that while intuitively, we might think that more mining would be good for the local economy, it turns out this isn't the case.

Given that the whole point of "revising" the withdrawal is to bolster domestic energy production to create jobs, secure energy independence, and help the economy, *New Times* decided to investigate the economics of uranium mining in the area.

"When people want to mine [uranium] in the U.S., I think, 'Really?' It's generally not worth it.

To do this, we spoke with more than a dozen experts in fields like hard-rock mining, mineral economics, hydrology, environmental law, and nuclear power. We analyzed global uranium market trends and data, learned about unconventional mining techniques, and spoke with local politicians who are familiar with the northern Arizona economy.

We also consulted reports from various federal agencies, think tanks, trade groups, the Government Accountability Office, the World Nuclear Association, and the International Atomic Energy Association's biennial report about the state of the global uranium market, *The Uranium Red Book*.

Tellingly, no expert or document made the argument that acquiring uranium from within the 2012 withdrawal is a matter of national security. No one said we needed it to keep the lights on now or in the foreseeable future. The world is flush with uranium that's cheaper to mine and the U.S. Department of Energy has huge stockpiles of enriched and raw uranium that could be used in a pinch, we were told again and again.

And finally, no one said that it would do much for the local economy. Some suggested that at best, it could create temporary jobs, though most felt that because of the stop-and-go nature of uranium mining, and the fears mining stokes about a radioactive accident, it would be more likely to cause harm than good.

"When people want to mine [uranium] in the U.S., I think, 'Really?' It's generally not worth it," says James Conca, a senior scientist at the energy consulting firm UFA Ventures Inc.

The quality and quantity of the uranium deposits in the area aren't great, and the global uranium market is already oversaturated, he says. More uranium mining in the region

“doesn’t make a lot of sense economically. It’s not going to help the local economy and it’s not going to help the people of Arizona.”



Yellowcake, a solid form of concentrated uranium that's ready for enrichment.

As far as elements on the periodic table go, uranium is probably one of the most controversial and interesting ones. Ubiquitous in nature, it ranges in color from bright yellow to red to even black. With an atomic weight of 238, it is the heaviest naturally occurring mineral on earth.

Perhaps ironically, uranium was considered garbage for centuries — a material with little value beyond its use as a coloring agent for ceramic glazes.

European miners who came across it while digging for more valuable ores took to calling it *pechblende*, a term that combines the German word *blende* (mineral), and *pech*, which translates to either tar or misfortune, Tom Zoellner writes in his 2009 book, *Uranium: War, Energy, and the Rock that Shaped the World*.

But in the 19th century, after scientists discovered radioactivity and identified its potential power, people began sifting through old mine tailings to find this newly valuable mineral.

By the time WWII ended and the rush to procure uranium for atomic weapons was in full force, this yellowish dirt had become one of the most important and highly sought after materials in the world — because only 0.7 percent of all uranium is the radioactive isotope, U-235, huge quantities of uranium are needed to make even a small bomb.

Fueled in part by the assumption that uranium was a rare element, the so-called “atomic rush” in the American Southwest was driven by the federal government’s insatiable appetite for U-235 and its desire to control as much of it as possible.

To this end, the Atomic Energy Commission, the precursor to the Nuclear Regulatory Commission, guaranteed to buy all mined uranium at bloated prices and offered \$10,000 to anyone who found a rich deposit. (If the financial incentives weren’t enough, mining uranium for our Cold War-era stockpiles was celebrated nationally as a patriotic act.)

Though a lot of uranium was mined during the 1950s in the Southwest, it only ever made a few people rich, and did so at the expense of the majority. Its legacy in the region is mostly one of devastation with short booms and long busts.

The atomic rush fizzled in the 1960s as scientists realized just how much uranium actually exists on earth — it is 40 times more abundant than silver and 500 times more abundant than gold. Suddenly, big uranium stockpiles became much less valuable and the global uranium market crashed.

Though a lot of uranium was mined during the 1950s in the Southwest, it only ever made a few people rich, and did so at the expense of the majority.

For the most part, mining companies just walked away from the mess of open mines and huge tailing piles, both of which were, and in some places still are, poisoning nearby communities with radioactive toxins.

Little changed in the market until about a decade later, when the oil shocks of the 1970s made the prospect of a world powered by nuclear energy seem possible and ideal.

Mining companies once again set their sites on the American Southwest and did some exploratory drilling, but the next uranium boom cycle never came to pass. Building nuclear power plants turned out to be a lot harder and pricier than initially thought. The uranium market slumped even more after the 1979 partial meltdown at the Three Mile Island nuclear power plant in Pennsylvania turned much of the public against nuclear power.

The next big rush to develop new uranium mines occurred in 2006-2008 as, once again, talk of a “global nuclear renaissance” fueled speculation about the coming demand for uranium. The global price of uranium, which had been trending below \$20 per pound for decades, began to rise in 2005 and then suddenly skyrocketed above \$100 in 2007 — at one point, it traded for \$137. (Unless otherwise noted, “pounds of uranium” refers to pounds of triuranium octoxide — U₃O₈ — the most common and stable form of uranium.)

Like most speculation-based market bubbles, this one eventually collapsed. The price was back to \$40 per pound by 2009-2010. In the intervening years, however, new mining claims and exploratory drilling projects popped up throughout the West, and mining companies took so-called “zombie mines” off standby. In just the 1 million acres that would later become the 2012 mineral withdrawal, miners staked 3,200 claims on federal land.

But with hundreds of abandoned mines still littering the region, local tribes, environmental groups, many in the outdoor recreation industry, and even some politicians feared the worst and petitioned the federal government to take action.

“There was huge support from a broad range of folks for protecting these lands,” says Sandy Bahr, director of the Arizona Sierra Club. “There is a history of contamination in the area, and there is really no way to clean up groundwater if it gets contaminated.”

In mid-2008, the George W. Bush administration declined to take up the cause. “But then the Obama administration came in, and within about six months of coming into office, said it was going to consider a withdrawal,” says Ted Zukoski, an attorney with Earthjustice who has litigated on behalf of the withdrawal.

In 2010, the Interior Department announced a temporary moratorium on new mining claims while it began the tedious, bureaucratic process of producing an environmental impact statement. (By that time, the price of uranium had dropped low enough that most mines in the region were on standby, anyway.)

Two years later, on January 9, 2012, Secretary of the Interior Ken Salazar stood in front of a crowd at the National Geographic Society in Washington, D.C., and announced the terms of the withdrawal. The purpose of the moratorium, he explained, was to give scientists time to study how mining could affect the ecologically sensitive Grand Canyon watershed.

No one really understands the complexity and interconnectedness of its underground aquifers and aboveground springs and wells, says Fred Tillman, a hydrologist with the U.S. Geological Survey who studies the area.

In the presence of oxygen, uranium is water-soluble, which means that as groundwater flows through soil and permeable rock, it carries the dissolved mineral with it. In northern Arizona, uranium carried by groundwater has collected in tubular underground deposits of broken rock called breccia pipes. The concern is what could happen when mining exposes these deposits to the elements.

“We don’t know the direction and rate of groundwater flow, and that is a basic principle of hydrology. If there was an impact from Mine A, would it go to Stream B? How long would it take to get there? One year? A thousand years? We just don’t know,” Tillman says.

The withdrawal was the Obama administration’s way of saying, “Let’s do a little time-out and see if we can get more information,” he adds.

But on March 28, President Trump issued Executive Order 13783, declaring that developing domestic energy sources was an administration priority. His order also directed federal agencies to “review existing regulations” and “appropriately suspend, revise, or rescind” anything that poses an “unduly burden” on this new goal.

Conservationists immediately worried that the 2012 moratorium would be targeted because the withdrawal area is estimated to contain 79 million pounds of uranium, a

supply that if extracted and enriched, could theoretically power our domestic nuclear fleet for about 18 months.

Turns out, their fears were justified. On November 1, the U.S. Forest Service published a report identifying 15 actions it could take to comply with the executive order. This list included “revising” the moratorium. To date, no one knows what the agency means by that — will they try to shrink the size of the withdrawal, limit the time its in place, or some combination of the two?

Forest Service spokeswoman Veronica Hinke declined to give details.

She also said that there is no timeline for moving forward on this matter, but for those living in Arizona, revision is an important question with potentially profound repercussions.



An aerial view of the Arizona One mine on the north rim of the Grand Canyon.

Though uranium exists all over the world, its distribution is far from even. The most concentrated deposit ever discovered was located in the middle of a hilly savanna in what is now the southern part of the Democratic Republic of the Congo. In 1915, a British geologist stumbled upon the area while scouting for copper. He noticed that the ground had a yellowish tint, a telltale sign of uranium, and collected samples for analyzing.

As it turned out, the ore in what would become the Shinkolobwe mine was about 80 percent uranium — this means that for every 100 pounds of earth removed from the mine, 80 pounds of it was uranium.

Over the course of a few decades, miners hauled about 500 million pounds of uranium out of the ground — most of the uranium used by the Manhattan Project actually came from here — but in the 1960s, the newly independent government of DR Congo shut it down. Some illegal mining continued, but mining companies discovered other rich deposits of uranium elsewhere around the globe.

Currently, the three biggest producers of uranium are Kazakhstan, Canada, and Australia. Of the 112 million pounds of uranium mined in 2016, the latest year for which data is available, these three countries accounted for 71 percent of it. If you include the next three biggest producers — Niger, Namibia, and Russia — the collective output rises to 85 percent of global production.

The U.S., by contrast, mined about 2.5 million pounds of uranium, or about 1.8 percent.

Of course, what a country does mine doesn't necessarily say anything about what it could mine. Given that there is essentially an unlimited supply of uranium worldwide, what's important is that not all of it can be recovered for the same price. Some deposits are harder to reach or are less concentrated; others are in countries with strict labor and environmental standards.

For this reason, when mineral economists and mining companies discuss uranium supplies, they talk about recoverable reserves at a given price. In other words, there's a lot more uranium for the taking if the price is high because mining companies can extract more ore profitably.

Intuitively, it makes sense that the higher the concentration of uranium, the more cost-effective it is to mine — it's more bang for your buck. While no mine has ever come close to Shinkolobwe's 80 percent uranium, some mines in Canada have ore that's 15-20 percent, which is a lot higher than what we have domestically.

Though the breccia pipes in the Grand Canyon area are thought to be some of the best deposits in the country, they're only estimated to be about only 1 percent uranium.

"We're still evaluating the economics of the mine, and hence the price we'd be willing to take for its uranium."

"I don't think anyone is arguing that these deposits are the best undeveloped deposits in the world," Rod Eggert, a mineral economist at the Colorado School of Mines says. The important question, he continues, is whether "these deposits are commercially viable."

As it turns out, answering that isn't particularly easy because every mine is different.

What would the minimum price of uranium need to be in order to make Canyon Mine worth mining?

“We’re still evaluating the economics of the mine, and hence the price we’d be willing to take for its uranium,” Curtis Moore of Energy Fuels tells New Times. “However, today’s market is probably close.”

Other experts we consulted thought that the current price was probably too low for most of the region’s uranium deposits. As evidence, some pointed to the fact that only a handful of the mining claims staked in the withdrawal area between 2006 and 2010 have ever been considered profitable enough to even begin development.

Since the 2011 triple meltdown at the Fukushima Nuclear Power Plant in Japan, the spot-price of uranium has hovered between \$20 and \$25 per pound. The price of long-term supply contracts for the nuclear industry, though not public information, is thought to be only a little higher.

These prices are so low that mining companies in Canada and Kazakhstan have taken some of their biggest mines offline until prices rise again.

“Producers don’t want to sell into a losing market,” says Travis Stills, a lawyer with Energy and Conservation Law. “It doesn’t make sense to spend money if you’re going to sell under cost.”



Roger Clark, director of the Grand Canyon Program at the Grand Canyon Trust, stands by Canyon Mine and explains how uranium mines harm the local ecosystem.

There are currently 449 civilian nuclear reactors producing power across 30 countries. With 99 of those reactors in the U.S., we are by far the biggest consumer of uranium. In 2016, civilian power plants used 113 million pounds of uranium — 48.5 million pounds of which were used by American plants, according to Nima Ashkeboussi, director of Fuel Cycle Programs at the Nuclear Energy Institute.

The global nuclear landscape, however, is changing. Reactors are shutting down in Germany and the U.S. — and largely staying offline in Japan — but China and India are building enough new power plants to tip our collective demand for uranium upward. The IAEA predicts that annual demand for uranium will be between 134 and 209 million pounds by 2035.

Thus, the question about uranium supply is not whether we have enough uranium right now, but whether we'll have enough in the future.

Apparently, no one should panic.

With just the mines that are already in operation, or have been permitted or planned by governments, the IAEA says we could meet our projected uranium demands through 2035. And that's not even taking into account things like civilian and military stockpiles of raw and enriched uranium, spent nuclear fuel, decommissioned nuclear weapons, mine tailings, and depleted uranium, which is what's left after the first round of U-235 is extracted during the enrichment process.

Global stockpiles are estimated to have between 1.2 and 1.4 billion pounds of uranium. And they're growing: "Supply from mines and secondary sources currently exceeds demand by about 30 million pounds [of uranium] per year," the IAEA reports.

"The DoE has massive stockpiles that they're keeping off of the market in order to promote a domestic uranium industry."

Domestically, the U.S. Department of Energy has uranium in excess of what's needed for national security purposes, though under federal law, it can only release a small amount of this supply every year.

This supply comes in many forms — highly enriched uranium, low-enriched uranium, natural uranium, and depleted uranium — but according to information published in April 2017, it includes the natural uranium equivalence of 26.7 million pounds of U3O8 and 208-260 million pounds of depleted uranium. To be clear, the DoE's excess uranium stockpile is larger than what is in the entire 2012 withdrawal area.

"The DoE has massive stockpiles that they're keeping off of the market in order to promote a domestic uranium industry," Stills says. "We're paying millions a year to maintain physical stockpiles."

It's pretty clear that disassembling even one of our nuclear weapons to fuel civilian power plants would be a nonstarter for the Trump administration. But what about buying old weapons from abroad?

There's certainly precedent for doing so. Between 1993 and 2013, the U.S. government purchased down-blended uranium from 20,000 Soviet-era weapons in a deal called Megatons to Megawatts. (Down-blending just means lowering the ratio of radioactive to non-radioactive uranium, i.e., turning weapons-grade uranium into fuel for power plants.)

There's no plan to resume any sort of similar program in the near future, but there's a lot of uranium to be had should Trump want to strike a deal — the Megatons to Megawatts program provided enough uranium to supply 10 percent of our electricity needs during the years it was active.



A "No Trespassing" sign outside of Canyon Mine, a uranium mine near the Grand Canyon.

Okay, I get it, there's a lot of uranium around the world, you might be saying. But what about energy independence? That is, after all, why the withdrawal could be "revised."

According to Eggert, the mineral economist, there's nothing inherently risky about depending on imported minerals. What is important, he stresses, is whether our relationships with the import sources are risky.

For the record, no one we spoke with expressed concern about the stability of our trade relations with Canada and Australia, which account for 45 percent of our imported uranium supply.

What many did say, however, was that when it comes to uranium, striving for energy independence seems like an odd policy goal. Only two countries, Canada and South Africa, produce more uranium than they use. The rest of us rely on imports, stockpiles, and to some degree, secondary sources like reprocessed radioactive waste and down-blended nuclear weapons.

Even the IAEA says that “the international trade of uranium is a necessary and established aspect of the uranium market.” Put another way, why would a nuclear operator buy uranium from Arizona when it could get the same product from Canada or Australia for half the price?

“The U.S. is really not geologically rich with uranium. There are much better places from a mining industry perspective to mine,” Stills says.

What’s more, conventional mining — i.e., digging or blasting a hole in the ground to extract ore — isn’t the only way to get new uranium.

In the last few decades, a greater and greater percentage of uranium has been extracted through in-situ recovery, or ISR. This involves digging a narrow hole deep into an underground uranium deposit, pouring an oxygen-rich sodium bicarbonate water solution into it, and then pumping it back out. Because uranium dissolves in this water solution, it can be isolated — “recovered” — once it’s back above ground.

“There are much better places from a mining industry perspective to mine”

ISR tends to be cheaper than conventional mining and works best when a uranium deposit is dispersed throughout a sandy or porous underground layer — the breccia pipes near the Grand Canyon are not ideal. There are ISR operations throughout the world, and in 2016, they accounted for 48 percent of all extracted uranium, including the majority of output in the U.S. and Kazakhstan.

Some experts we spoke with also noted that both conventional and ISR operations could be obsolete in the next few decades as the technology to extract uranium from seawater improves and becomes more cost-effective. There’s an estimated 4 billion tons of dissolved uranium in the ocean, enough to power 1,000 nuclear reactors for 100,000 years, according to Conca.

In the meantime, given the amount of uranium we have stored away and the cheap price of importing it, it seems odd that the U.S. would consider opening the Grand Canyon region to new mining operations.

“The moratorium doesn’t mean the asset is gone forever; it just means you can’t use it now,” Mehl of Headwaters Economics says. “You want to use an asset when it’s [worth the

most], so building a mine when uranium prices are at an all-time low seems like a recipe for the mine closing.”



With the headframe, shaft, and hoist in place, Energy Fuels still needs to install ventilation shafts and do more underground development before the actual uranium mining can begin.

“When people say we import uranium because it’s not economical to produce in the U.S., that’s not a purely economic thing. It’s also a regulatory question,” says Kenny Stein, director of policy at the Institute for Energy Research, a Washington-based nonprofit policy research firm that advocates for free markets.

He emphasizes that his organization is not opposed to taxing and regulating mining activity, just the idea of a flat moratorium. “Maybe you don’t want to have a free-for-all in the Grand Canyon, but saying we can’t develop anywhere in the watershed, I think that’s getting a little excessive,” he says.

His solution? Lift the moratorium and let the market decide whether mining in the withdrawal is economical. Predictably, not everyone agrees with him.

“To say that lifting the moratorium would give you pristine market conditions is misleading, because there are some things the market doesn’t value properly,” the Sierra Club’s Bahr says. One of those, she believes, is the Grand Canyon.

“We shouldn’t just say, ‘Oh, let’s let the market decide that this place is worth more than a mining company that wants to make a quick buck.’ What if, God forbid, it affects the water? That can’t be cleaned up, and then what do you do?”

Other critics of Stein’s argument, like Anne Mariah Tapp, a natural resources consultant and former energy program director of the Grand Canyon Trust, say that if we lift the moratorium, we have a fairly good idea about what will happen.

Mining companies will stake a lot of claims, do some exploratory drilling, get the mineshafts in place, and then wait for the price to rise. And the moment the price drops again, the mines will go on standby.

“The zombie-mine analogy is a little overplayed, but it’s apt,” Tapp says. “Once it’s not in the company’s economic interest to continue the mine, they can either close it down and reclaim it, which costs a lot, or they can put it on standby and basically do pretty minimal work.”

“Ultimately, the real issue here is that there is so much that we don’t know.”

Mines on standby do have to comply with environmental controls and periodically submit reports to regulators, but environmental groups believe enforcement has generally been sloppy and weak.

Consider what happened in 2008, when the mining company Dennison Fuels wanted to reopen Pinenut Mine near the North Rim.

The mine had been on standby for about 20 years, and during that time, 2.8 million gallons of water collected in the mineshaft. The water had a dissolved uranium content that exceeded EPA safety standards, and there was really no way to know whether some of it seeped into local aquifers. (Dennison sold all of its American uranium mines to Energy Fuels in 2012.)

“Ultimately, the real issue here is that there is so much that we don’t know,” says Amber Reimondo, energy program director of the Grand Canyon Trust. “We were all taught to use the precautionary principle — better safe than sorry — especially when costs are high and gains are low.”

Barring the establishment of a national monument that will preclude uranium mining forever, the 2012 moratorium will expire in 2032. Hopefully by then, we’ll have a better sense of how uranium mining affects the ecosystem. In the meantime, the safest and most fiscally responsible place to keep the uranium in the Grand Canyon watershed appears to be right where it is — in the ground.



What are we risking?

Some time in the next few years, Energy Fuels will begin extracting uranium from Canyon Mine. Assuming there are no starts and stops because of market fluctuations, the mining process itself will take a few years and should yield 2.5 million pounds of uranium. At peak production, the operation will employ about 60 people.

Once removed from the ground, the uranium-laden ore will be loaded onto trucks and driven 300 miles north through Flagstaff and the Navajo Reservation to the White Mesa Mill in Blanding, Utah. There, it will be crushed, treated with chemicals, and turned into yellowcake.

In discussing Canyon Mine's future, Moore of Energy Fuels acknowledges the industry's dark past, but says he believes that technological advances and better environmental regulations mean the company can mine safely and responsibly today.

"Energy Fuels and our management and employees are members of the public, too. We live, work, and play in northern Arizona, too. We don't want to cause any environmental damage or negative long-term impacts from our operations," he says.

No one doubts that's true, but the fact remains: Accidents happen.

In economics, we talk about the difference between accounting costs and economic costs. The first refers to a company's balance sheet — how much am I spending to mine one

pound of uranium and how much can I sell it for? The second includes bigger-picture costs and consequences, or what economists call externalities.

Whether it makes sense to mine uranium from an accounting point of view is a question for mining companies; whether it makes sense from the economic point of view, though, is a public policy question. And public policy needs to consider externalities, which in this case includes things like jobs, the region's image and reputation, impacts on the tourism industry, and yes, the environment.

Currently, tourism is the biggest driver of the northern Arizona economy. Mining, meanwhile, employs fewer people and carries a lot more risk.

Locals worry about radioactive dust, their drinking water, and highway accidents involving trucks carting uranium ore. The Flagstaff City Council recently passed a symbolic measure declaring that it didn't want uranium transported through the city — just imagine what a big uranium spill on Highway 40 would do to the region's image?

Why take such big risks for something that's expensive to mine, not necessary for national security or domestic energy production, and most importantly, not going anywhere?

Perhaps author Zoellner sums it up best when he tells *New Times*, "We have a priceless cultural resource and minimal uranium deposits. Carting that uranium away would create a 100-year blight on the land and — potentially — a poisoned river and many lost lives. To chance it for the sake of a dying industry is the height of foolishness.

"It is tempting to compare it to Trump's promise that America would become great again if only we could double-down on coal mining. The romance might be tempting, but the reality is pathetic."