

Uranium Mining on the Navajo Reservation

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Uranium and its use through the 20th century and 21st century have been a global issue of contention, some laude its use in nuclear power to be the energy resource of the future while others present fears over health and safety on a massive scale. These individuals and groups ask if the risks of contamination after disaster are worth the advantages of a powerful and consistent energy source. Others sing the praises of uranium power and find the risks and traumatic outcomes to be negligible and something of the past, accidents at Three-Mile Island and Chernobyl to be learned from and unlikely to be repeated. As the world seeks a power source that is cleaner, safer, and cheaper is it fair for the United States to ask the Navajo, long burned and sickened by uranium to resume mining operations on their reservation? Upon examination, the troubled history of uranium mining reveals a pattern in which the government failed to adequately protect those who lived around and worked with uranium on the Navajo Reservation. The United States Government did not adequately protect uranium miners on the Navajo Nation from lung diseases related to radiation exposure, allowing profit to take priority above health through the atomic age. Of additional concern are the scars that uranium mining has left upon the land, spreading the impact of uranium mining beyond the miners themselves to their families and non-participant individuals residing on the reservation.

According to the archaeological record, most estimate that the Navajo people have occupied the four corners region in the desert southwest since 1000 CE. The archaeology suggests that the Navajo ancestors migrated south from Northwestern Canada and Alaska into the area they call the Diné Bikéyah or Navajoland¹. Linguistic anthropologists agree that the Navajo Dine language is of the Athabaskan family and is closely related to the Apache language and can be understood by some northern Canadian Indigenous, further supporting the migration

¹ Navajo Nation DIT, "History of the Navajo Nation", Navajo Nation Government

theory². The Navajo people were largely hunter gatherers until contact with the Pueblo, who they learned cultivation techniques from and later became herdsman and horsemen after contact with the Spanish³.

After the defeat of Mexico by the United States government, the Navajo homelands were gained in the Mexican cession and Colonel Kit Carson implemented a scorched earth policy in which as many Navajo were rounded up as possible and their livestock killed. The 8,000 Navajo that he rounded up were forced to begin what would be called “The Long Walk” in 1864, a 300 mile walk to Fort Sumner in New Mexico. On this brutal journey, the Dine would lose an estimated 2,000 people to exposure, physical stress upon young and old and disease, though no official records were kept declaring exactly how many Navajo died. Upon their arrival, the Navajo were forcibly held at Bosque Redondo, though a limited few escaped and returned to the Dine Bikéyah. Bosque Redondo was a barren a harsh environment and shelter and food was difficult to come by disease was rampant and crops planted by the Navajo failed each season. Government rations were inadequate and inconsistent, and the Navajo were left to starve and freeze in the frigid New Mexico winters. By 1868, the high cost of keeping the Navajo at Bosque Redondo was starting to wear on an overextended US treasury, William Tecumseh Sherman was among the members of a small group from Washington that came to draft a treaty with the Navajo leaders allowing them to return to their homelands. The treaty of Bosque Redondo did grant the Navajo the opportunity to return to the Dine Bikéyah, but the four long years of suffering had left deep scars on the people who had lost many on The Long Walk and during their imprisonment.

² Edward Sapir, "Internal Linguistic Evidence Suggesting the Northern Origin of the Navajo," *American Anthropologist*, Vol. 38, no. 2, (April-June 1936), pp. 225-232.

³ Indian Health Service, “Navajo Nation”, US Department of Health and Human Services, <https://www.ihs.gov/navajo/navajonation/>, Accessed December 1, 2019

Upon returning to their homelands, the Navajo found that white settlers had begun to encroach upon the reservation lands granted to them in the treaty. Further encroachments into their lands were consistent through the late 1800's and into the first quarter of the 1900's as the tribe was not consulted when the government gave mining and grazing rights to companies and outside individuals. At other times, such as during the First World War, minerals were outright stolen from the reservation, including the carnotite ore that Madame Marie Curie and Pierre Curie used in their experiments on radioactivity⁴. The Navajo Nation Council was not consulted when, in 1919, the United States Congress decided to open the reservation to mining and oil claims, this conflicted with many of the Navajo's desires. Following this, mining claims would quickly dot the reservation lands, most claims were searching for gold, others for oil and some for vanadium. It would be the vanadium that would begin the Navajo relationship with uranium and the US government.

Disease and mining have had a long relationship that had been identified long before the US began its operations on the Navajo Nation. As early as the 1400's, miners in eastern Europe were subjected to what was called "Bergkrankheit" translated to mean "mountain sickness". They showed many of the same signs of those affected by altitude sickness but were affected at low altitudes. The correlation of this sickness and mining activity was long observed in Germany and Czechoslovakia and was first studied there. Agricola wrote that there was an exceptionally high mortality rate among miners and that they typically died of respiratory diseases⁵. There the miners processed ore that was laden with uranium for the use of dyeing ceramics and tinting photographs.

⁴ (Pasternak 2011)

⁵ Agricola, G. *De Re Metallica*. Basel, 1556. New York: Dover Publications. English reprint (Hoover translation). 1950, p. 214.

Mining related lung cancer was first written about comprehensively in 1879, after a study done by F. H. Harting and W. Hesse of Germany. Their report included autopsy results on miners, of the 650 men that they surveyed, 150 men had died from 1869-1877 of “miners’ disease”. Another study this time done in Jachymov, a region of Czechoslovakia, concluded much of the same findings of that done by Harting and Hesse, miners exposed to certain metal ores including ones that contained uranium were at disproportional risk of developing lung cancer. This study completed by Pirchan and Sikl studied the lungs of Erz Mountain miners who died from 1929-1932 discussed the findings of the autopsy and irregularities attributed to mining⁶. Pirchan and Sikl also put forth the idea that lung cancer was possibly caused by radioactivity, showing the demonstrable rates of radioactivity in the mines of Jachymov and Germany and the rates of lung cancer shown in their study and that of Harting and Hesse⁷. This was met with criticism from others in the scientific community as some such as Lorenz believed that lung cancer among miners was a result of genetic predisposition rather than radiation⁸. This was indeed an evolving science through the 40s as cancer was becoming more well understood by the medical field but by the late 50s, it was widely known that respiratory diseases were caused by the inhaled particles of radon and their offspring radiating the tissues they came into contact within the respiratory tract⁹. Scientists and government officials knew the risks of mining radioactive ore and refused to complete measures that would reduce exposure for Navajo workers despite the known lessons from Eastern European mines in the late 19th century and early 20th.

⁶ Pirchan, A., and H. Sikl. 1980. Cancer of the lung in the miners or Jachymov (Joachimsthal). *Am. J. Cancer* 4:681–722, 1932

⁷ Pirchan, A., and H. Sikl. 1980. Cancer of the lung in the miners or Jachymov (Joachimsthal). *Am. J. Cancer* 4:681–722, 1932

⁸ Lorenz, E. 1944. Radioactivity and lung cancer; a critical review of lung cancer in the miners of Schneeberg and Joachimsthal. *J. Natl. Cancer Inst.* 5:1–13.

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Natural uranium is found in most animals and plants in small quantities as well as in the environment in rocks, soil, and water. This uranium that is found naturally in most things is radioactive but is minimally so and contributes very little to background radiation levels which humans are unaffected by¹⁰. Uranium was first discovered in 1789 by Martin Heinrich Klaproth in Germany, from the pitchblende ore and named the new compound after the newly discovered planet Uranus. Following this, in 1841 uranium was first isolated by heating uranium tetrachloride with potassium to make uranium metal. Uranium was used in the discovery of radioactivity in 1896 by Henri Becquerel, when a piece of photo paper was exposed to uranium, the photo paper fogged up after being radiated¹¹. Shortly after in 1898, Madame Marie Curie discovered radioactive materials radium and polonium and called the activity of the ionizing rays emitted by these materials' "radioactivity", putting a name to the phenomenon that Becquerel identified. The use of uranium was furthered following the successful splitting of the atom by Fritsch and the reality of the use of nuclear fission for use in weapons through the Second World War. This birthed the Manhattan project, a project that would create the world's first nuclear weapons. The project required hundreds of tons of uranium to be enriched, this demand was met by stockpiles from the Belgian Congo but also from uranium ore waste that was a byproduct of vanadium mining on the Colorado. This uranium came from mines on the Navajo reservation, purchased under the name of "vanadium waste" by the Army Corps of Engineers¹². Vanadium mining had begun on the Navajo Nation in 1941 following a decision by congress in 1938 to allow the reservations the right to grant and stake claims on their lands¹³. "Vanadium waste" or

¹⁰ Agency for Toxic Substances & Disease Registry, <https://www.atsdr.cdc.gov/csem/csem.asp?csem=16&po=5> Uranium Toxicity Where Is Uranium Found? Case Studies in Environmental Medicine, May 1, 2009, accessed December 7, 2019

¹¹ (James Trefil 2019)

¹² (Pasternak 2011)

¹³ (Pasternak 2011)

Uranium ore, was used successfully in the Trinity Test at Alamogordo, New Mexico in 1945 and in the bombings of Nagasaki and Hiroshima¹⁴. The use of the nuclear weapon ensured that the atomic age had truly arrived, and uranium access would become paramount to world supremacy and access to large amounts of it would become increasingly necessary.

As the second World War came to an end, the United States government turned towards the next adversary, the Soviet Union, and the rise of Communism. It is against this backdrop of communist fear that the story of Navajo uranium mining unfolds. The Atomic Energy Commission (AEC) was signed into existence by Congress in 1946 during the presidency of Truman to foster the development of atomic science and technology during peacetime¹⁵. The AEC would control the use of uranium but not its production, allowing mines to be operated by private companies but was the sole buyer of uranium produced in the United States until 1966 when commercial sales began¹⁶. The AEC declared an assured price for uranium in the United States and this created a mining boom on the Colorado Plateau where deposits were already confirmed¹⁷. Uranium was plentiful on the plateau and by 1958, seven million tons of ore were estimated to lie in over 7500 finds and 750 mines open during the peak of the industry in 1955¹⁸. This boom was just that, a boom waiting for its bust, this came when the AEC decided to remove their guarantee on price for uranium and private need died off in the early 70s. This die-off left many unemployed and left most mine sites unremedied, an estimated one thousand mine shafts remained open¹⁹. As the uranium boom drew to a close in the seventies, the realization that the

¹⁴ (Pasternak 2011)

¹⁵ Niehoff, Richard (1948). "Organization and Administration of the United States Atomic Energy Commission". *Public Administration Review*. 8 (2): 91–102. doi:10.2307/972379. JSTOR 972379.

¹⁶ (EPA n.d.)

¹⁷ Ringholtz RC. *Uranium Frenzy: Boom and Bust on the Colorado Plateau*. New York, NY: WW Norton & Co; 1989.

¹⁸ Committee on the Biological Effects of Ionizing Radiation. *Health Effects of Exposure to Radon (BEIR VI)*. Washington, DC: National Academy Press; 1999.

¹⁹ (EPA n.d.)

business which allowed the United States to remain at the top of the military world was sickening their families was dawning on the Navajo.

The yellow pigmented rocks and dirt that were common in the Navajo homelands were called “leetso” and were of no use to Navajo before the arrival of prospectors on the reservation. After though, uranium mining would be many Navajos first interaction with the greater US economy. Mining brought some economic growth to the reservation but still severely underpaid miners, pay stubs from 1949 show an hourly wage that ranged from \$0.81 to \$1.00 barely above minimum wage of \$0.75 for hazardous work that included blasting, support building, moving product and more²⁰. Unsurprisingly, disparities in treatment inside the mines were commonly reported by Navajo, most of the leadership was white and these individuals spent less time inside the mines. Others report that of the workers, Navajo were often forced to go into the mines immediately after the blasts when dust and debris were still visible in the air while white workers were allowed to wait for the air to clear²¹. Despite this treatment for miners, Navajo continued to work in the mines for months and years, for many this was the only option and allowed for miners to remain close to their families and work on the reservation. This long-term exposure to radioactive material in unventilated subsurface mines spelled out a high mortality rate for Navajo that was studied long before any regulations were enforced in these mines.

Regulations for appropriate levels of radon in uranium mines were enforced in Jachymov after a government program that mandated ventilation procedures in 1930. The standard of a working level of 1 became the norm and the program was successful in reducing the levels which ranged from .35 to 8.9 working levels (with more than 1.0 being considered hazardous) to

²⁰ Brugge, Doug, and Rob Goble. (2002) “The history of uranium mining and the Navajo people.” American journal of public health vol. 92,9: 1410-9. doi:10.2105/ajph.92.9.1410

²¹ (Pasternak 2011)

consistently .35 working levels²². This successful reduction of radon in the mines demonstrate the ability of lawmakers to enact change that could have improved air quality for miners in the United States through ventilation. Regulations like these were not implemented in the United States until 1969, thirty-nine years after Czechoslovakia's. Further damning to the record of the United States was revelation that the Public Health Service (PHS) had been conducting testing on the uranium miners without their knowledge and without disclosing their findings specifically to the miners and had found a concrete association between mining and lung disease²³.

The Public Health Service began its testing and examination of uranium miners in 1950, pairing their medical examinations with the allocation of resources to study the radon levels in the mines these men were working in²⁴. These investigators did not inform the miners of the risks they strongly suspected. The researchers that conducted the public health study were required to be impartial outside parties and required to keep the findings to themselves. This was a direct violation of the Nuremburg code, endorsed a mere three-year prior which stipulated that in medical studies participants must be informed of risks and must be willing participants²⁵. The study found that of an expected 10 deaths caused by lung cancer of Navajo individuals 34 perished of the cancer, over a three hundred percent increase from what was expected for non-smoking individuals. The study was completed in 1960, regulations were not implemented to control radon in the mines until 1969. In these nine years, uranium miners were unnecessarily exposed to radon levels significantly over working levels established in Czechoslovakia.

²² History of the exposure of miners to radon. *Běhounek F Health Phys.* 1970 Jul; 19(1):56-7.

²³ Advisory Committee on Human Radiation Experiments. Final Report: Advisory Committee on Human Radiation Experiments. Washington, DC: US Government Printing Office; October 1995.

²⁴ Advisory Committee on Human Radiation Experiments. Final Report: Advisory Committee on Human Radiation Experiments. Washington, DC: US Government Printing Office; October 1995.

²⁵ Brugge, Doug, and Rob Goble. 2000 "The history of uranium mining and the Navajo people." *American journal of public health* vol. 92,9 (2002): 1410-9. doi:10.2105/ajph.92.9.1410

The AEC purposely stalled on making standardized working conditions for the Navajo with knowledge of the risks that working with uranium posed.

“The AEC wrote worker health requirements in contracts with companies that handled beryllium. After conflicting recommendations from staff, it chose not to establish such requirements for uranium. It claimed to lack legal authority, but it did not explain the legal difference between uranium and beryllium. The AEC did not lack knowledge: records of a January 25, 1951, internal meeting of AEC and PHS staff reveal that, on the basis of early measurements, they believed that radon was present in levels that would cause cancer and that ventilation could abate the hazard.”²⁶

This quote from an AEC worker establishes proof that there was a known hazard and that there were known abatement procedures that could limit radon exposure. The AEC also recognized that Beryllium mining and production caused health problems that could be minimized through ventilation. The health problems recognized by OSHA bear a great similarity to those of uranium, including lung cancer and its symptoms²⁷. A possible reason that these regulations were imposed on the beryllium mines and not the uranium mines is that nearly all the beryllium mines were not on reservation land. These mines were situated in Colorado, Utah, Oklahoma, and North Carolina and were not on reservation land²⁸.

Finally, in the 50s, measures were finally taken to help ensure the proper ventilation procedures (which had been known for years) were observed in the mines. The government still failed to take complete responsibility for their role in creating unsafe working conditions by choosing to encourage private companies which operated the mines to follow the procedures instead of passing legislation that required this. Unsurprisingly, many Navajo reported that these guidelines were rarely observed and when they were it was typically in the largest mines that were inspected regularly. Even when federal and state legislature was passed in 1960 the required ventilation to bring radon levels down to the determined working radon level of one,

²⁶ (Administration n.d.)

²⁷ (Administration n.d.)

²⁸ (Survey 2019)

these procedures were often ignored. This failure of compliance can be observed in the lack of a significant fall in observed average rates of radon exposure in the 50s until 1960. There was a more dramatic fall after 1960 until 1962 and these rates again declined gradually²⁹. Still, these new regulations did not negate the harm already done to the bodies of Navajo who had mined before them.

Navajo men who had worked in the mines for weeks, months and years were falling ill and dying at shocking rates. Leaving a hole where fathers, brothers, sons, and friends used to be. This did not go unnoticed by the Navajo community and many began to ask questions on why their family members were suffering from lung diseases despite being non-smokers. A wave of Navajo activism was born, primarily among women who had been widowed. They gathered in homes across the reservation and began to talk about their deceased husbands and how they died, finding similarities in their illnesses and work histories. The most tenacious supporter of bringing the issue of compensation to the US government was a tribal council member named Harry Tome of Red Valley. He raised awareness of the need for a compensation system like that of the black lung compensation for coal miners of Appalachia that was passed in 1968. His efforts and others created a bill that enlarged the black lung bill to cover uranium miners in 1972. This bill was never passed and Navajo were forced to redirect their efforts into a bill that was exclusively for the needs of uranium sickened individuals. Tome worked with John F Kennedy's secretary of the interior in 1979 to file lawsuits seeking damages perpetrated against uranium miners, one of these aimed to hold the mining companies responsible, the other to hold the US Department of Energy culpable. The lawsuit against the mining companies was dismissed because these illnesses were covered under workman's compensation, despite many claims filed

²⁹ (Pasternak 2011)

previously being denied or Navajo not filing claims to receive such compensation³⁰. One may see their lack of filing of these claims as related to lack of education of available resources to Navajo as well as the poor literacy rates of the miners³¹. In 1982, former miners both white and Navajo testified at a Senate hearing in Salt Lake City. They spoke passionately about what they had endured in work and throughout their sicknesses³².

As the 80s progressed Navajo continued to gather and push for compensation for the miners and their families. The creation of the Uranium Radiation Victims Committee based in Red Valley created the final effort to pass a compensation bill. This came in the form of the 1990 legislation called the Radiation Exposure Compensation Act (RECA). This bill comprehensively acknowledged that the United States government had failed in its duty to adequately warn and protect uranium miners from the risks they faced in their work. The bill made it possible for those affected by uranium mining to receive up to \$100,000 in compensation for medical expenses. Following the passage of RECA, forty percent of living miners filed for compensation by March of 2005 and 407 million dollars have been paid out to Navajo under RECA³³. Still some Navajo do not feel that their needs have been adequately met and cite lofty medical bills and invasive medical exams to receive compensation³⁴. Where Navajo workers mined for the substances that would allow the US to continue to dominate both economically and militarily

³⁰ Ringholtz RC 1989. *Uranium Frenzy: Boom and Bust on the Colorado Plateau*. New York, NY: WW Norton & Co; 1989

³¹ Brugge, Doug, and Rob Goble. 2000 "The history of uranium mining and the Navajo people." *American journal of public health* vol. 92,9 (2002): 1410-9. doi:10.2105/ajph.92.9.1410

³² Radiation Exposure Compensation Act of 1981—Part 2: Hearing Before the Senate Committee on Labor and Human Resources, 97th Cong, 2nd sess (Salt Lake City, Utah, April 8, 1982)

³³U.S. Department of Justice (USDOJ). (2005) Radiation Exposure Compensation System: Claims http://www.usdoj.gov/civil/omp/omi/Tre_SysClaimsToDateSum.pdf

³⁴ (Pasternak 2011)

This history of poor working conditions and lack of precautions for Navajo workers led to the 2005 ban of Uranium mining on the reservation. The 2005 ban was labeled as the Dine Natural Resources Protection Act of 2005 and was signed by Joe Shirley Jr. President of the Navajo Nation. The press release from the Navajo Nation on April 30th, 2005 detailed some comments President Shirley made regarding the history of Uranium mining. ““As long as there are no answers to cancer, we shouldn't have uranium mining on the Navajo Nation,” the President said after signing into law the Dine Natural Resources Protection Act of 2005. “I believe the powers that be committed genocide on Navajo land by allowing uranium mining.”” This statement speaks on the legacy of death and cancer that Uranium has left on the Navajo as Navajo leaders and activists still believe that mining poses significant health risks to the population. President Shirley’s use of the term genocide shows the seriousness of the perception of Uranium mining for the Navajo and the distrust that is evident. He goes on to explain that this decision was to protect Navajo and to exercise their right as a sovereign nation in the 21st century, ““I don't want to subject any more of my people to exposure, to uranium and the cancers that it causes,” he said. “I believe we reinforced our sovereignty today.””. This press release delivers a message of Navajo refusal to participate in a system that has failed to protect them in the past.

The United States was the world’s leading uranium producer from 1953 to 1980 when prices took a nosedive and mines closed. This fall in price per pound of Triuranium Octoxide (U₃O₈) made uranium mining in the US cost ineffective and imports rose substantially in the following decades to meet domestic need. The uranium industry attempted to combat foreign competition through requests for limits on imports to twenty-five percent of the market in 1985 which would keep domestic needs met and the industry afloat. Through the end of the century

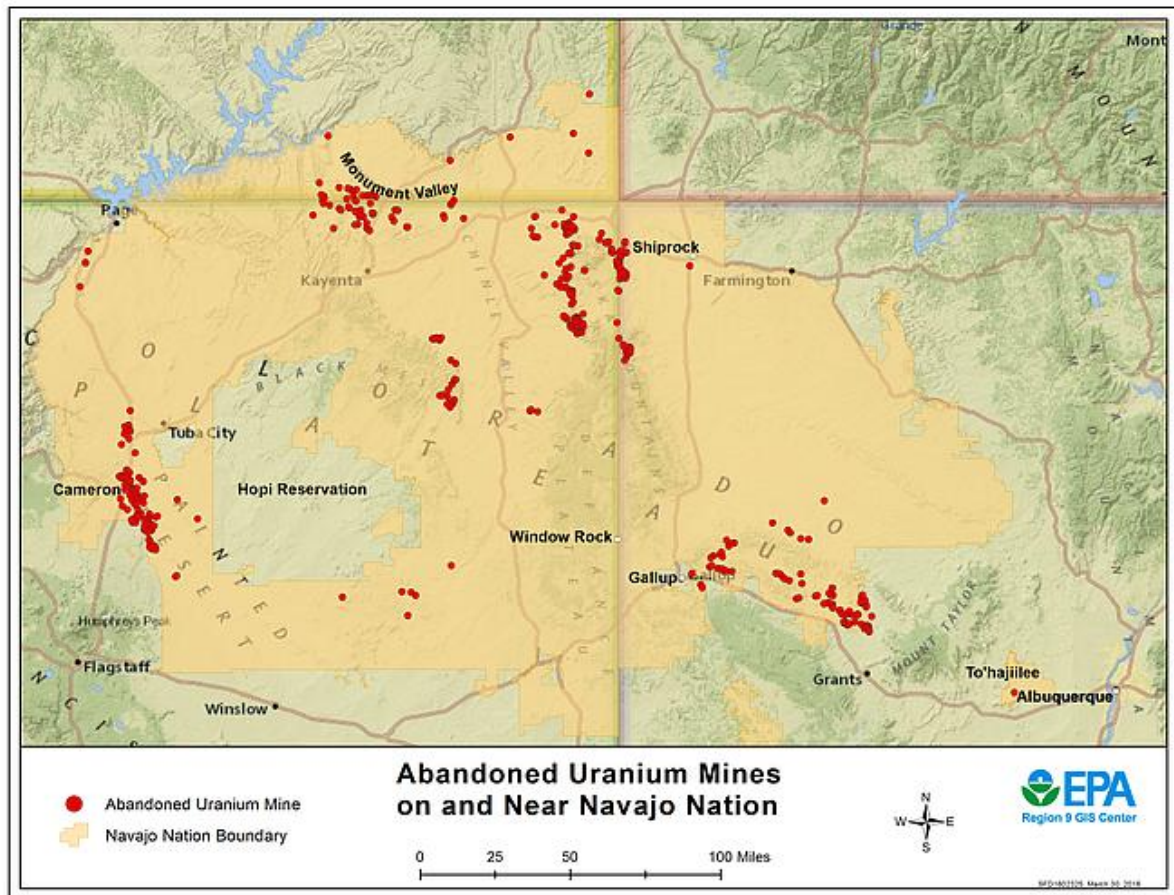
and up to the 2005 ban, prices continued to decline, in 2001 prices reached a low of \$7.92 weighted average price. As a result of multiple factors uranium mining has seen a serious boom in value with prices increasing more than tenfold from \$7.92 weighted average price in 2001 to \$88.25 in 2007, a record high after the Navajo ban of 2005. Multiple companies have approached the Navajo nation to repeal the ban and promise the nation higher royalties and remediation on the land. So far, these offers have been refused and the ban stands³⁵.

Despite this ban, uranium and its byproducts still affect the Navajo population, and this can be seen most vividly in the scope of the ecological impact. In 2009 the Environmental Protection Agency determined there to be over 500 abandoned mines on the Navajo reservation. Of these mines some posed hazards as potentially radioactive others posed physical threats as open shafts to people and livestock. A 5-year plan was created that placed priority on the mines that were the most radioactive and were the closest to dwellings. In 2014 a new 5-year plan was created that continued the same efforts as the previous to remediate the most dangerous mines. Over the course of these two plans, over 1.7 billion dollars have been spent, of tax money and funds provided by EPA lawsuits of former mining companies. The most successful of these was the 2014 decision *Tronox Inc. V. Anadarko Petroleum Corp* which awarded the Navajo nation with 1 billion dollars for the purpose of remediation of uranium mines operated by Anadarko's parent company Kerr-McGee.³⁶ Kerr-McGee was reorganized in 2005, making Tronox liable for environmental damages incurred by Kerr-McGee, leading Tronox to pursue litigation in the Anadarko bankruptcy. The Navajo Nation was a claimant pursuing damages for 49 unremediated

³⁵ Dooley, Erin E, 2008, Navajo Fight Uranium Comeback, Environmental Health Perspectives, May 1, 2008, Vol.116, Issue 5.

³⁶ "Navajo Nation," Navajo Nation, April 3, 2014, [https://www.navajo-nsn.gov/News%20Releases/OPVP/2014/apr/Navajo%20Nation%20To%20Recieve%20\\$1%20Billion.pdf](https://www.navajo-nsn.gov/News%20Releases/OPVP/2014/apr/Navajo%20Nation%20To%20Recieve%20$1%20Billion.pdf).

mines operated by Kerr-McGee and received 23 percent of Tronox’s 5.15 billion settlement from Anadarko.³⁷



2018 EPA Survey of Abandoned Mines³⁸

Beyond the mines, homes on the reservation that were built from contaminated materials including uranium milling waste also required remediation. These were addressed through the Contaminated Structures Project which determined dwellings and other buildings with heightened levels of radiation. After these buildings were identified the EPA evaluated the

³⁷ “Case Summary: Court Decision in Tronox Bankruptcy Fraudulent Conveyance Case Results in Largest Environmental Bankruptcy Award Ever,” EPA (Environmental Protection Agency, July 11, 2018), <https://www.epa.gov/enforcement/case-summary-court-decision-tronox-bankruptcy-fraudulent-conveyance-case-results-largest#:~:text=On%20December%2012%2C%202013%2C%20the,the%20defendants%20%22acted%20to%20free>

³⁸ Environmental Protection Agency, “Navajo Nation: Cleaning Up Abandoned Uranium Mines,” EPA (Environmental Protection Agency, February 18, 2021), <https://www.epa.gov/navajo-nation-uranium-cleanup>.

structures to see if they could be saved or if they required demolition and rebuilding. Since the institution of this project the EPA has removed 47 structures including homes. The estimated cost for the cleanup and rebuilding of the homes was 250,000 for each home³⁹. The goal of all the EPA projects is to confirm that uranium mining and its byproducts no longer pose a health threat to Navajo including their land and water.⁴⁰

The reach of uranium toxicity has extended beyond just the miners that worked in the mines directly from 1944 to 1986 but has persisted into more recent generations. In an alarming measure of the amount of uranium that remains in the bodies of Navajo, an estimated 27 percent of Navajo have elevated rates of uranium in their urine, the national average for elevated levels is 5 percent. Cancer rates in the Navajo nation doubled from 1970 to 1990. As noted previously, the contamination was not limited to the miners but instead spread to their families through casual contact, dust on their clothes and skin. The water that seeped from the mines pooled and leaked into rivers where Navajo watered themselves (forty percent of Navajo did not have running water as of 2018) and their livestock. Children played in pools of contaminated water and around debris piles that were unrestricted.⁴¹ The impact of uranium mining cannot be relegated to the past, it is ongoing and the severity of the lack of protections for Navajo is still yet to be seen.

The United States government failed to protect the workers that allowed the nation to rise as the nuclear power of the 20th century, building their reputation as a fearsome beast on the

³⁹ Felicia Fonseca, Associated Press. "EPA to Rebuild Uranium-Contaminated Navajo Homes: Salt Lake Telegram." *Deseret News*, Jun 15, 2009., <http://libproxy.uwyo.edu/login/?url=https://search-proquest-com.libproxy.uwyo.edu/docview/351756998?accountid=14793>.

⁴⁰ "Health, Education, and Human Services Committee Approves Report from Navajo EPA Addressing Uranium Mining Impacts." *Targeted News Service*, Dec 23, 2014., <http://libproxy.uwyo.edu/login/?url=https://search-proquest-com.libproxy.uwyo.edu/docview/1639802032?accountid=14793>.

⁴¹ Laurel Morales, "For the Navajo Nation, Uranium Mining's Deadly Legacy Lingers," NPR, April 10, 2016, <https://www.npr.org/sections/health-shots/2016/04/10/473547227/for-the-navajo-nation-uranium-minings-deadly-legacy-lingers>.

labor of the Navajo while ignoring their needs until it was too late for many. The passage of RECA did assist in compensating for some of the injustices they faced but cannot replace the lives already lost to lung diseases. The story of uranium mining on the Navajo nation is far from over as the Navajo continue to fight for remediation and recognition by the government. It should be expected that the Navajo will continue to be active proponents of the ban on uranium mining even as prices continue to rise throughout the decade.

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