

**Statement of Karen Wenrich, PhD, CPG**  
**Natural Resources Committee**  
**Subcommittee on National Parks, Forests and Public Lands**  
**United States House of Representatives**

**November 3, 2011**

**Concerning**  
**H.R. 3155, Northern Arizona Mining Continuity Act of 2011**

Chairman Bishop and Ranking Member Grijalva, thank you for giving me the opportunity to voice my support of H.R. 3155, the Northern Arizona Mining Continuity Act of 2011. The northern Arizona proposed withdrawal is a subject of great importance to me, as well as to the uranium mining industry, the nuclear energy industry, the residents of Arizona and southern Utah who are eager to work, and to all who operate on our nation's public lands. I will focus my comments today primarily on the geologic and economic significance of northern Arizona uranium ore deposits and the previous successes of the regulatory system in monitoring and protecting the environment from any harm by mining. I will refer to some of the numerous studies which I authored and co-authored as an employee of the U.S. Geological Survey, the International Atomic Energy Agency, and as a certified professional consulting geologist. Additionally, I will be referring to reports produced by experts in the uranium industry who have spent most of their careers in the northern Arizona uranium district with years of hands on experience mining and protecting the environment. I will also present a new vital geological component of the district that has not been publically disclosed to-date.

**Significance of Northern Arizona Uranium**

First, it is imperative to address the staggering geological importance of northern Arizona uranium. According to two USGS studies (Otton, et.al. 2010 and Finch, Wenrich, et.al. 1987— Attachment D), the proposed withdrawal area contains an estimated uranium endowment in excess of 326 million lbs, and has “the potential of becoming the second most important uranium-producing region in the United States”. Despite such conclusive government-authored statements, both the Draft Environmental Impact Statement and the recently released Final EIS have failed to recognize the significance of this enormous district of uranium and polymetallic ore deposits. Through bureaucratic slight of hand, these two documents have erroneously and dramatically minimized the significance of the resource—both the size of the endowment and its impact on domestic energy production. But numbers don't lie. According to the Nuclear Energy Institute, the 326 million lbs of uranium present in this district is the equivalent to enough electric power for the 8 million people of New York City for 57 years. Additionally, the Environmental Impact Statement (EIS) totally fails to address the vast resource of an additional

40 energy strategic metals that are rich in this vast valuable mineral district. As Gene Spiering, V.P. of Exploration, Quaterra Resources, explains the reason for the EIS's gross understatement of the uranium resource:

*The major error...is the assumption that mineralized uranium breccia pipes are uniformly distributed throughout the region and that the potential loss of uranium is directly proportional to the number of acres withdrawn, not which lands are withdrawn. Exploration has demonstrated that nearly all the known mineralized pipes and all of the economically viable uranium deposits in northern Arizona have been found in a N-S trending mineralized "corridor" that is approximately 45 miles wide by 110 miles long. (Spiering, et.al. 2010, Exploration and discovery of blind breccias pipes: the potential significance to the uranium endowment of the Arizona Strip District, Northern Arizona – Presentation to SME Annual Meeting-Phoenix, AZ.) (Attachment B)*

The 800 to 1,000 breccia pipes drilled outside of this corridor have been barren of ore. All of the northern Arizona withdrawal parcel lies within this uranium-rich corridor because the government simply located the area with the most mining claims and divined it to be worthy of withdrawal. As a former US Geological Survey employee it is my recollection that the objective of wilderness and other land withdrawals was to select an area to preserve as wilderness that minimized the loss of mineral wealth to our nation, not to maximize it. The corridor to be withdrawn is the heart and essentially the total resource of the northern Arizona breccia pipe uranium district, and therefore, any withdrawal (Alternatives "B", "C" or "D") would restrict indefinitely future development of this world-class resource and the United States' major uranium reserves that could significantly fulfill our domestic uranium needs as a major step in our road to energy independence.

Why are northern Arizona breccia pipe uranium mines so desirable? The Secretary says that a 20-year withdrawal is in order because we need to evaluate the impacts of the handful of additional mines that are currently exempt from the withdrawal. Yet the Secretary has not laid out a process in his EIS that would give hope to the nation's electricity consumers that this fuel for electricity would ever be available in the future. It is the Secretary's clear intention with this EIS not to impose just a "temporary" 20-year ban, but, in fact, to forever close off access to this fuel supply. (1) First of all, the Secretary's EIS shows no environmental impacts that cannot be readily mitigated. (2) Secondly, the Department of the Interior's EIS fails to honestly recognize the many environmental attributes of breccia pipe uranium mining. This is the kind of clean mining any serious pro-environmental advocates should be promoting that can be displayed to countries through the world as a model to emulate in the goal to clean, safe, and environmentally friendly mining. (3) Thirdly, the secretary chooses to ignore the research work that has already been done, both inside the Department of the Interior's USGS results and the preliminary findings by the University of Arizona in its ongoing study which according to the Environmental Working Group shows "...that much of the uranium in the (Colorado)River is naturally occurring, a key indication that the industrial activity does not harm the water quality for

drinking water and agricultural activity that depends on the River for water.” (February 23, 2009, Environmental Working Group, “Study May Hamper Fears over Uranium Mines Effects on Colorado River”) (attachment C) The fact that environmental groups engaged in fear mongering with downstream water users in Las Vegas and southern California does not make the case for prohibiting breccia pipe uranium mining. That such fears are scientifically ungrounded is demonstrated by research by the Arizona Geological Survey in their calculations of the non-effect of a hypothetical ore-truck spill on the drinking water quality of the Colorado River (attachment A). (4) Fourthly, knowing that no breccia pipe uranium tailings are produced or left on site in northern Arizona and deliberately trying to confuse the Moab, Utah mill tailings issue next to the Colorado River with breccia pipe mining is grossly misleading. There is no relationship between the Moab mill tailings and breccia pipe uranium mining. (5) Finally, recognizing the weakness of his environmental arguments, in football terms, the Secretary called an “audible” between the Draft EIS and Final EIS and switched the “emergency” away from the environment (the original justification for the withdrawal) to ostensible social and cultural reasons in a crass attempt to use Native Americans and the injustices the Federal government committed against them in the 1950s under a totally different set of circumstances. At that time the issue was national defense and the Soviet threat. Today’s environmental laws imposed upon industry safeguard the public against any such social, cultural or environmental impacts. It’s a shame those same laws were not in effect in the 1950s to protect the public against its own government. Of the three legs the Secretary chose to build his stools foundation, none of them stand as a reason to deny this source of fuel to the nation’s electricity consumers.

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### **Inciting Fear through Emotional Hysteria**

Similar to the way the Bureau of Land Management (BLM) has downplayed the significance of the uranium resources, it has vastly overstated the environmental harm caused by past and potential uranium development. A case in point is the “danger” to the region’s watershed—particularly the Colorado River—caused by rare and inconsequential ore spills. In response to concerns about contamination of the vast and enormously valuable water resource, Jon Spencer of the Arizona Geological Survey and I calculated just how much damage could be done by such a hypothetical ore spill – calculations that a high school student could do and certainly the BLM and other Department of Interior agencies should have done. These calculations are presented as a published report by the Arizona Geological Survey (attachment A) and conclude the following:

*“Colorado River water in the Grand Canyon region contains about 4 µg/l (micrograms per liter) of uranium (equivalent to 4 parts per billion by mass), with approximately 15 cubic km annual discharge. Thus, approximately 60 metric tons of dissolved uranium, derived by natural weathering of rock over the Colorado River drainage basin, are carried annually by the Colorado River through the Grand Canyon. We considered a hypothetical, worst-case accident in which a truck hauling thirty metric tons (66,000 lbs) of 1%-uranium ore is overturned by a flash flood in Kanab Creek and its entire load is washed 60 km down Kanab Creek into the Colorado River where it is pulverized and dissolved over one-year to become part of the dissolved uranium content of the river (such a scenario is extremely unlikely, if not impossible). This addition of 300 kilograms (660 lbs) of uranium over one year would increase uranium in Colorado River water from 4.00 ppb to 4.02 ppb. Given that the EPA maximum contaminant level for uranium in drinking water is 30 ppb, this increase would be trivial. Furthermore, it would be undetectable against much larger natural variation in river-water uranium content.” (cited from Spencer & Wenrich, 2011), Breccia Pipe uranium Mining in the Grand Canyon Region and Implications for*



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

Uranium levels in Colorado River Water, Arizona Geological Survey Open-File Report OFR-11-04, Version 1.0, 13 p. – Attachment A.)

Anyone in a decision-making role over the withdrawal of the northern Arizona lands should review the new PBS documentary that was just televised called “Radioactive Wolves of Chernobyl”. Chernobyl was unquestionably the world’s worst nuclear disaster with radioactive emissions equivalent to 400 Hiroshima bombs and understandably created worldwide emotional concern. Yet, even here perhaps things are not quite as bad as expected. Because there are no people within 1100 square miles around the reactor, a lush wilderness has been regenerated. The wolves, beavers, eagles, falcon, bison, and moose are thriving. Radiation levels in the animals are high, but still after 25 years there are no signs of mutations in any of the creatures with the possible exception of door mice living right at the site of the nuclear accident. The abundant eagles are a sign that the eco-system is in robust health. This is a good example of how the emotional hype has portrayed this disaster as a barren wasteland that could never recover. Northern Arizona contains natural uranium that cannot even remotely be compared to Chernobyl – yet, one would think from the emotional hysteria that people expect Chernobyl-style contamination. The worst that can happen is what is happening naturally in the Grand Canyon today – millions of tons of high-grade uranium are eroding naturally into the Colorado River and its tributaries. If anything, mining will help remove this natural river water “contaminant”.

### **An Attempt to Dismiss Scientific Facts by Invoking a Smoke Screen**

Accusations of conflict of interest have been asserted for my ownership and sales agreement of 61 mining claims that I have held on the Arizona Strip since 2009. The research on which this report is based was begun in 1978 and 95% of it was completed by 2002. I challenge anyone to find errors in this testimony, specifically any that could even remotely be impacted from my claim ownership during the past two years. For Mr. Grijalva to attempt to dismiss 30 years of solid scientific data from a renowned, certified researcher in this uranium district for a recent agreement that is 6 months old is nothing more than smoke and mirrors and is not in the very spirit from which he insists this withdrawal is based – to save a natural resource for the American people by presenting all available data. Minerals are also a natural resource and just as the American tourist should have the opportunity to view the beauties of northern Arizona so should the American consumer have the opportunity to benefit their lifestyle from mining of the minerals from northern Arizona. Previous mining of this wealth from 1980-1990 has proven that the two goals are not mutually exclusive and can successfully coexist.

Furthermore if there is any conflict of interest, it is with ranking member Representative Grijalva who sits on the board of directors for the Center for Biodiversity, one of the organizations that has been the driving force for this land withdrawal. Because of this conflict of interest Mr. Grijalva should be excusing himself from any committee deliberations on this withdrawal or any lobbying of the executive branch of government to complete this withdrawal.

## **Value Added to the Breccia Pipe Ore with the Recovery of Energy Strategic Rare Earth Metals**

This unique Arizona polymetallic-rich uranium, breccia-pipe district is known for its large reserves of high-grade uranium that have been estimated by the US Geological Survey to comprise over 40% of the US domestic uranium resources, and the highest-grade in the U.S. Up until the past 5 years the price of most metals had been sufficiently depressed so that little was done to explore or study the presence of the polymetallic ores, rich in the district's uranium deposits. In just 3 years since 2008, the price of most rare earth elements (REE) has increased over 10-fold. This is true of all Energy Critical Elements, including Co and Cu, also heavily enriched in the breccia pipe ore. These important metals commonly comprise over 1% of the ore.

Rare earth elements (REE) are significantly enriched in the breccia pipe ores. However, last month REE research completed in Nancy, France by Wenrich, Lach and Cuney by Laser Mass Spectroscopy and the Electron Microprobe proved that within the breccia pipes these energy strategic and critical metals are enriched in the actual uraninite crystal, the ore mineral found in the breccia pipes. This is significant because it facilitates the economic removal of these strategic energy metals. The current supply of REE will not be able to keep up with the new and ever growing global demand. This potential shortage could seriously impact US renewable energy sources, communications, and defense industries, leaving the US, currently with no operating REE mines, and very vulnerable to control by REE-rich China. These strategic, multi-use elements are known to occur only in very few economic deposits around the world. With over 97% of the world's supply presently produced by China, and with the Chinese demand soon matching, if not eclipsing, its own internal supply, the US could soon be left in the cold. Currently China has export taxes on REE of 15-20% and has put restrictions on the amount exported. We are already feeling the pinch in the skyrocketing price of terbium (a heavy REE)-needy compact fluorescent bulbs, bulbs that new government restrictions are requiring the average American to replace their incandescent bulbs with. Forecasts now predict a critical shortage of REE for the rest of the world outside of China by as early as 2012. In 2008 China produced 97% of the worlds REE, India 2.2%, Brazil 0.5% and Malaysia 0.3%.

REE are indispensable in a wide variety of clean energy technologies. They are used in the advanced nickel-metal hydride (NiMH) batteries, which are found in most modern hybrid cars. Powerful neodymium (Nd, a light REE) magnets enable the new generation of wind turbines, electric and hybrid electric cars (Prius), and generators. REE phosphors illuminate compact fluorescent light bulbs (Tb), and elements such as cerium (Ce) and neodymium (Nd) have been used for decades as coloring agents in synthetic gemstones and glass, and Ce has been used as a polishing compound for over a half century. In the defense sector REE are required for military electronics, communications and surveillance equipment, and missile guidance systems. Tomahawk cruise missiles use REE magnets in tail control fins; and samarium (Sm)-cobalt(Co)

magnets are used for flight control surfaces on missiles, Sidewinders, Phoenix, etc. Cerium has been used to treat water, particularly arsenic-rich waters. In essence, it can be safely said that with the past decade of advanced technology US energy and national security are heavily dependant on REE.

The US has these REE at their fingertips in the Arizona breccia pipe province. To recover the REE from the breccia pipes would not require new techniques to be developed. Removal of the REE from the uraninite has previous precedence. REE were extracted as a by-product of uranium mining in Canada during 1966-1970 and 1973-1977. “For a short period of time heavy REE were extracted from the rafinate fluids that emanated from the chemical processing of uraninite at Blind River, Ontario” (Mariano and others, 2010). “At Elliot Lake an yttrium concentrate [including REE] was obtained from the residual ion-exchange solutions after leaching uranium ores with sulfuric acid...The filtered and dried product graded 60-70% REO including 30-35%  $Y_2O_3$ .” (Lucas and Ritcey, 1975, cited in Henderson, 1984, p.441).

The analyses of the REE in the breccia pipe uraninites have shown that they are rich in some of the rarer and more expensive of the REE, such as dysprosium, europium, neodymium and terbium. For example, below is a graph of neodymium, essential to the super strong magnets needed in wind turbines, versus uranium for over 60 bulk rock breccia pipe analyses. The actual Nd in the uraninite lattice is significantly higher than that shown in the graph. The correlation between neodymium and uranium is evident from the trend of this graph, which follows from the concentration of neodymium, as well as all of the REE. in the uraninite crystal structure.

## Bulk Rock Uranium versus Neodymium in Arizona Breccia Pipes

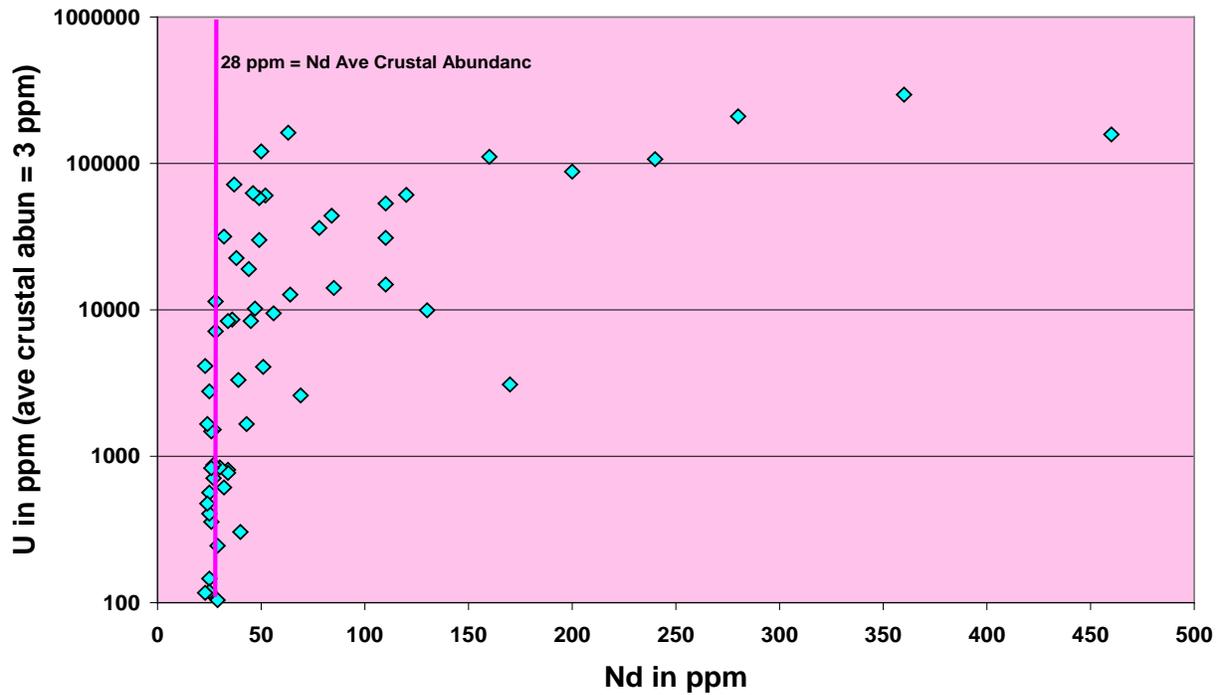


Table 1. Rare earth element content of Sage orebody sample, South Rim. All element concentrations are in parts per million (ppm). Data are from Wenrich, Lach & Cuney (analyses done in CREGU, University Henri Poincare, Nancy, France, Sept 2011)

Rare Earth Elements	Sage Orebody	Average Crustal Abundance
La	52	30
Ce	409	60
Pr	127	8
Nd	922	28
Sm	588	6
Eu	189	1
Gd	837	5
Tb	120	1
Dy	583	3
Ho	90	1
Er	200	3
Tm	20	0.5
Yb	286	3
Lu	12	0.5
Y	2426	2

## Summary

The northern Arizona EIS assumes that 6 mines producing 1800-2400 tons of uranium ore/day could be operating. Assuming an average grade of 0.65%  $U_3O_8$  this district would produce approximately 9.5 million lbs of  $U_3O_8$  per year. Uraninite studied by Wenrich, Lach, and Cuney in France showed the total REE content of the uraninite to be 0.43%. Therefore, 40,850 lbs of REE could be produced from the 9.5 million pounds of  $U_3O_8$ . Yttrium, commonly considered to be a REE since it is associated with them, makes up another 0.25% bringing the total REE to 0.68%. The REE by-products would have a value added of \$15 million dollars based on today's REE prices and the individual element concentrations in the uraninite. Another \$1.8 million from yttrium brings the total to \$16.8 million annually. Finding domestic sources of REE would be an enormous boost to our economy – this is \$16.8 million that will remain in our country rather than increasing our foreign debt. Additionally, the amount of copper, cobalt, nickel, silver, lead and zinc that constitute over 1% of the ore can, and will, also be mined as by-product metals at today's prices. They will add another approximate \$10 million dollars to the economic savings of our foreign debt. Retaining American jobs to mine and process domestic sources of energy strategic metals is critical to our economic and security survival.

By the wave of the executive wand these huge metal resources will be stricken from the United States strategic metal stock pile just when our jobless rate is huge and China's strong arm is reaching globally to control the world's strategic metals. We won't have to worry about invaders marching into our country with guns, they won't need to, we will be conquered by loss of our economic strength and our inability to produce our domestic mineral wealth. How can we turn our back on domestic uranium to fuel our 20% energy source in nuclear power? At the same time we will be denying the American consumer rare-earth elements needed for wind turbines, solar panels and our new energy efficient compact fluorescent light bulbs, batteries and critical military components.

This submitted testimony presents to the Committee sound historical and scientific data that underscores the importance of energy resources in these Arizona breccia pipe deposits that contain natural, metal-bearing ore deposits that have a safe record of production to meet domestic energy needs. These ore deposits are now also recognized to contain an important and essential source of energy critical elements (REE, copper and cobalt) for the continued progression of American diversification of industry, employment opportunities, national security, and elevated living standard for its citizens today and its children tomorrow. These deposits should be available to be developed to the fullest and safe extent for the American consumer.