

## Arizona Uranium Breccia-Pipe District - One of America's Most Strategic Mineral Resources: Fact or Myth

**Karen Wenrich**

*Consulting Geologist, Golden, CO.*

The northern AZ polymetallic U, solution-collapse brecciapipe district is famous for its large reserves of high-grade U that are estimated to comprise over 40% of US domestic reserves. In addition, the U ore in some pipes contains significant concentrations of neodymium (Nd), a rare-earth metal needed to produce the strong magnets necessary for wind turbines and hybrid electric cars (Prius). Currently, 95% of the world's Nd is produced in China. A direct correlation exists between U and Nd in breccias-pipe ore. For U concentrations >1%, the Nd content ranges from 2-18 times average crustal abundance. Rare earth elements were extracted from uraninite in the past from Blind River, Ontario. Significant concentrations of Ag, Co (used in Sm-Co magnets), Cu, Ni, Pb, and Zn are also significantly enriched in the U ore. Co averages 800 ppm (up to 2.6%) for 79 samples with U concentrations >0.1%. Within the oxidized portions of some breccia pipes, concentrations of Ga and Ge are significantly elevated; Ga and Ge are used in semi-conductors, transistors, and optical equipment. A 1987 estimate of U endowment in the district concluded that it contains >2 billion pounds of  $eU_3O_8$ . The 12 percent of the district remaining for mineral development contains drilled discoveries indicating over 325 million pounds of  $U_3O_8$ . Yet, this strategically valuable, mineral-rich land is now being considered for withdrawal from mining. Such a withdrawal of land will freeze up not only a vast resource that can provide us energy independence for domestic U, but could also contribute to the loss of our domestic resources of other strategic metals, Nd (480 ppm), Ga (0.14%), Ag (0.24%), Co, Cu (20%), Ni (6.2%), Pb (8.4%) and Zn (35%).

A USGS report just released attempts to evaluate the environmental impact of mining in the area, and will be used in the withdrawal determination, but it does not appear to be based on unbiased sampling. For example, the Hack 1 reclaimed area was studied to evaluate the quality of the reclamation. Yet, that site is within 200 ft of a historic mining site dating to the 1800s, which was abandoned to weathering and allowed to erode and disseminate sulfides and metals into the environment. It is impossible to segregate the 100-year old contamination from the reclamation work completed in the 1980s. There were 3 other reclaimed sites, the Hack 2, Pigeon, and Hermit that had no old historic mine workings. Why were they not chosen instead for the evaluation of the quality of 1980s mining reclamation?

Additionally, the report states that the area to be withdrawn only contains 12 percent of the district's U resources. This leaves the impression that withdrawing the area from mineral entry will have little impact on domestic uranium supplies. However, they fail to mention that most of the remaining 88 percent of the district was either previously withdrawn from mineral entry or is currently unavailable. What little land would be left for mining has little to no discovered uranium reserves, and much of the area simply has too much overburden to be economic at anything short of a 100 fold increase in the uranium price. Yet, despite all of these efforts, the report demonstrated that there is virtually no threat to the Grand Canyon or its watershed from modern mining activities which have occurred since the passage of NEPA in 1969.