Testimony for H.R. 3155, the Northern Arizona Mining Continuity Act of 2011

Mr. Chairman, I want to thank you for holding this hearing and allowing me to testify on H.R. 3155, the Northern Arizona Mining Continuity Act of 2011.

Mr. Chairman, this legislation will stop the U.S. Department of the Interior from banning mining in a vast area of Arizona that represents the nation's second largest domestic source of uranium ore.

The Department of the Interior intends to withdraw, as early as this month, 1 MILLION acres of Arizona land with the goal of preventing uranium mining on that land for the next 20 years. Studies by Dr. Charles Sanchez and Dr. John Chesley of the University of Arizona have shown no threat to the Colorado River by mining this uranium. According to the results, uranium "in the main channel of the Colorado River are generally consistent with the normal weathering of uranium containing geomedia within the watershed and rule against major contamination from uranium mines". Regarding agriculture soils in the Lower Colorado River Region, the study concludes "no increase in bioavailable uranium after 35 years of irrigation and fertilization." Regarding uranium exposure to food crops, the study concludes "potential uranium exposure to vegetable and food crops produced in the Lower Colorado River Region are negligible relative to health risks".

Mr. Chairman, with all of this data and the total lack of any evidence from the Bureau of Land Management indicating the unsafe operation of the uranium mines, the Obama Administration is still willing to make up to approximately 326 million pounds of the best uranium in the country off-limits. This shameful effort by the Obama Administration is a step in precisely the wrong direction for the American economy, making the U.S. even more dependent on foreign powers and potentially creating a serious national security threat going forward.

Mr. Chairman, Mohave County, a county in my District that will be directly impacted by Secretary Salazar’s needless withdrawal of prime mining lands on the Arizona Strip, already has an unemployment rate of 10.6%. The rate is even higher in specific areas of the county; Butler area of Kingman (16.2%), Golden Valley (21.3%), and Dolan Springs (23.7%). The locking up of a million acres of mining lands in Northern Arizona ignores the economic realities of the State and will do fiscal harm to the local area.

An economic analysis performed by Tetra Tech detailing the benefits of the uranium mining industry in the North Arizona Uranium District concluded that there will be

$29.4 billion in output over the 42-year lifespan of the project, including $2 billion in federal and state corporate taxes and $40 million annually in payroll.

Mr. Chairman, uranium mining would create more than a thousand jobs directly related to mining operations, and many more jobs would be created as a result of the economic activity associated with the mining.

As indicated by the Governor of Arizona, “if instituted, this uranium mining ban would deal a blow to future economic growth near the Grand Canyon.”

Additionally, of America's existing 104 operating nuclear reactors, 90% now import the uranium they use from foreign countries, including Russia and Kazakhstan, as opposed to the 1970's, when America was 100% self-sufficient. This potentially creates a serious national security threat going forward.

Mr. Chairman, in 1984, Congress passed the Arizona Wilderness Act that specifically recognized the uranium potential of 490,000 acres of BLM land and 500,000 acres of Forest Service lands by releasing them from wilderness study classification ***so that they could be mined.*** The bill was a collaborative effort that included the mining and livestock industries, the National Parks Conservation Association, the Wilderness Society, and the Sierra Club.

To this day, uranium mining activities on these lands have a record of productive operation and successful reclamation without impacting the environment or our awe-inspiring National Parks. The nearest mine would be about 6 miles from the Grand Canyon National Park boundary and 10 miles from the Canyon itself. Mr. Chairman, that is from where we are sitting now to Falls Church, Virginia.

According to United States Geological Survey, northern Arizona uranium reserves total about 326 million pounds -- or enough energy to power the entire state for Arizona for 80 years. By prohibiting exploitation of the northern Arizona uranium reserves, the Obama Administration will potentially weaken America's long-term national security, our economic security, and our ability to be energy self-sufficient. This legislation would stop the Obama Administration from eliminating our country's most significant source of uranium.

Mr. Chairman, thank you again for holding this hearing today. It is my hope that the members of this subcommittee will appreciate the importance of moving this legislation forward. Thank you.

ACERT

ECONOMIC IMPACT OF URANIUM MINING ON COCONINO & MOHAVE COUNTIES, ARIZONA

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TETRA TECH

September 2009

complex world
CLEAR SOLUTIONS™

Cover Picture: 2007 Airborne geophysical survey being conducted in northern Arizona.

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ECONOMIC IMPACT OF URANIUM MINING ON COCONINO & MOHAVE COUNTIES, ARIZONA

EXECUTIVE SUMMARY

This analysis[1] was prepared to estimate the potential economic impact of mining uranium contained in 1,069,000 acres in northern Arizona (see Figure 1), in an area known as the Northern Arizona Uranium District (NAUD). The lands are being considered for withdrawal from mineral entry and claim processing by the U.S. Department of Interior.

Economic impacts of NAUD mining:
- **1,078 new jobs in the project area**
- **$40 million *annually* from payroll**
- **$29.4 billion in output over the 42-year life of the project**
- **$2 billion in federal and state corporate income taxes**
- **$168 million in state severance taxes**
- **$9.5 million in claims payments and fees to local governments**

Mining the NAUD uranium would have enormous economic impacts to businesses and households in Coconino and Mohave Counties, Arizona, nearby counties in Utah, the State of Arizona, regional mining service suppliers, and the federal government.

Coconino and Mohave Counties are the region of influence (ROI) for this analysis, which also addresses impacts on neighboring counties in Utah and on regional mining service centers. The economic impacts are based on estimates by the United States Geological Survey and private companies that 375 million pounds of uranium oxide could be derived from uranium ore in the NAUD. This analysis uses a conservative sales price of $50 per pound for uranium oxide; higher prices in the future would yield greater economic benefits.

Economic Impacts

The northern Arizona uranium mining operations would provide a significant long-term benefit to the area, state, and region: a direct total sales impact of $18,900 million over the 42-year duration of the project, with indirect impacts of $10,508 million, for a **total impact of $29,408 million, or an average annual impact of $700 million**.[2]

Summary of Economic Benefits

	ACERT Companies	Indirect Impact	Total Impact
Over the 42-year life of the project:			
Sales ($ Millions)	$18,900	$10,508	$29,408
Average Annual Impacts:			
Sales ($ Millions)	$450	$250	$700
Earnings ($ Millions)	$25	$15	$40
Employment (number of jobs)	390	688	1,078

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[1] This report was prepared by Tetra Tech, Inc., an internationally known environmental consulting firm. Tetra Tech's qualifications are found in Section 9, List of Preparers. The report was commissioned by the American Clean Energy Resources Trust (ACERT), and ACERT and its members have provided production and employment estimates. The analysis is also based on other information obtained from other sources deemed to be reliable (see Section 8, References). Although funded by ACERT, the report is an independent assessment of the potential value of the uranium resource and the economic impacts of mining the resource. The report was prepared for use by third parties (legislative bodies and government agencies of the United States, Arizona, and Utah) to assist in policy decisions.

[2] These estimates are based on a conservatively assumed constant price of $50 per pound for uranium oxide, with six mines in operation per year over a 42-year period, except for start-up and close-out, when not all six mines would be in production. The analytical methodology is discussed in Section 4, Methodology & Definitions.

Earnings and employment are expressed in terms of annual impacts. Annual wages of $25 million would generate indirect impacts of $15 million, for a total of $40 million annually. The companies expect to employ a total of 390 workers annually during the years when all six mines are operating; this total includes miners, geologists, engineers, managers, and other professional and support staff. These workers are projected to generate an additional 688 jobs in the ROI, for a total increase of 1,078 jobs during the years of full operation. A portion of these benefits would occur in neighboring Kane and San Juan Counties, Utah, where some workers would likely reside.

Impacts would be lower during the initial years of the proposed project and at the end, but benefits would still be substantial. Again, this would be a significant benefit to workers, families, and businesses, and to the local, state, and federal governments.

The proposed project would lead to other area and regional economic benefits as well.

The White Mesa Mill in Blanding, Utah, employs 150 workers during full production.

- Ore mined from the NAUD would be taken to the **White Mesa Mill, in Blanding, Utah**, for processing, and would ensure the continued operation of the mill, along with the substantial benefits it provides to San Juan County and its residents, and would improve the economic opportunities for suppliers in Blanding, the surrounding areas, and the region.
- Mining companies contract with **trucking firms** to ship ore from mines to processors. The economic impact is local, as contract firms typically hire personnel and build service shops locally. Over the 42-year operating period, transporting the ore would generate about **$1.6 billion in revenues for trucking firm**s, **long-term stable employment for their workers, and a steady stream of revenue for their suppliers**.
- Other beneficiaries include national mining equipment companies; suppliers for items such as tires; oil companies providing fuel; and a host of other firms that employ workers across the United States, in areas far removed geographically but not economically from Arizona.
- **Federal, state, and local governments** would receive a variety of tax revenues over the 42 year life of the proposed project, including corporate income taxes, severance taxes, payments to county governments, and income taxes from workers. The mining companies project payments of **$2 billion in federal and state corporate income taxes** and **$168 million in state severance taxes** over the life of the project. Local governments would receive **$9.5 million in claims payments and fees**. All of these payments would represent sizable benefits to the governments involved.
- **Local property tax bases** would increase as workers moved into the area and purchased homes. Existing residents would see their incomes increase with better jobs, and could purchase larger homes or improve existing ones.
- **Local and state sales taxes** would increase from purchases by the mine operators and their suppliers, by workers and their families, and by other local residents who see their incomes rise as an indirect impact of the mining operations.

This project would counter the paradox that exists in many resource-rich areas, where the economic development impact leaves the area with the raw material — instead, this project area and region would benefit in many ways from the economic investment by the uranium mining companies.

Proposed Project

The economic analysis is based on the following operating scenario assumptions:

- The mines would be operated under a "rolling" schedule that extends over 42 years. Except for the initial and closing years, six mines would be in production during any given year.
- Operations would include the following over a 5-year cycle for each set of six mines:
  - Year 1: Planning and permitting;
  - Year 2: Development, and installation of machinery and infrastructure;
  - Years 3 and 4: Production; and
  - Year 5: Reclamation.
- There are several advantages of the rolling schedule approach:
  - The 42-year schedule would ensure a long-term, stable workforce in the project area, avoiding the undesirable "boom-and-bust" impacts that can stress communities.
  - The project's longevity would allow local workers to work many years in an industry that provides higher-than-average wages and benefits.
  - Workers who moved into the area would bring their families and settle into the community, contributing to long-term healthy growth and strengthening the local tax base and growth of services.
  - Suppliers and other businesses could feel confident about opening or expanding in the project area, given the long-term nature of the project.
  - Impacts related to transportation of machinery and ore would be minimized, thus reducing traffic and the wear and tear on the transportation network.

The 42-year operating schedule would ensure a long-term, stable workforce and stronger communities.

The Project Area

The mining operations would take place in Coconino and Mohave Counties, Arizona, defined as the region of influence (ROI). The adjacent Utah counties of Kane, San Juan, and Washington are also addressed. Population in Coconino and Mohave Counties is heavily concentrated in the southern portion of those counties. The region near the potential mining areas, especially in the northern portion, is sparsely settled with low populations, but has experienced moderate growth during this decade. The population of the project area is largely white (Caucasian) except in San Juan County, where Native Americans comprise over 56 percent of the population. In the remaining counties, Native Americans are the predominant minority.

The project area is sparsely populated, but has grown modestly since 2000.

The ROI economies were reasonably diversified as of 2007, while the adjacent Utah counties reflect a more rural character. Tourism associated with the Grand Canyon and other regional attractions is an important economic factor. Average 2008 unemployment rates were close to the national average of 5.8 percent. By May 2009, all five counties had seen increases in unemployment, but only Mohave County equaled the national unemployment rate of 9.1 percent. See Section 3 for a more detailed description of the project area.

Northern Arizona Uranium

The NAUD represents an important domestic supply of low cost uranium. The US consumes approximately 50 million pounds of uranium annually. Uranium in fuel assemblies loaded into U.S. civilian nuclear power reactors during 2008 contained 51 million pounds of U_3O_8 (uranium oxide), yet only 12 percent of the U_3O_8 was U.S.-origin uranium, and 88 percent was foreign-origin uranium.

The U.S. Geological Survey Circular 1051: *The 1987 Estimate of Undiscovered Uranium Endowment in the Solution-Collapse Breccia Pipes in the Grand Canyon Region of Northern Arizona and Adjacent Utah,* gives the 1,069,000 acre- (1,670 square mile-) area subject to the proposed withdrawal a calculated mean endowment of 112.4 tons of U_3O_8 per square mile and a total mean endowment of 187,690 tons (375 million pounds) of uranium oxide, equivalent to *about 42% of the total uranium resources in the United States*.

The worldwide market demand for uranium used in power generation was 114 million pounds in 2008. Annual demand is expected to rise to 170 million pounds by 2030, with a total of an *additional 599 million pounds* required over the next 22 years. The NAUD can provide 50% of this additional demand.

During the 1980s, seven mines in the NAUD produced 19 million pounds of uranium, the energy equivalent of approximately 676 million barrels of oil, with a temporary surface disturbance of less than 20 acres per mine—*an area smaller than a Wal-Mart parking lot*. The mine reclamation left the disturbance undetectable and provided a positive example of environmentally effective mining under the nation's current mining and environmental laws.

The uranium mineralization in the NAUD is hosted in cylindrical, vertical columns of broken and re-cemented rock referred to as breccia pipes. The structures are 200 to 500 feet in diameter (see Figure 2). The mineralization occurs at a depth 1,100 to 1,700 feet below the surface and the lowest occurrence is approximately 1,100 feet above the water table.

The NAUD ore averages roughly 0.65% uranium—generally about five times higher than any other uranium deposits in the United States.

- All mining is conducted by (hard rock) underground methods since neither open pit or in-situ leach methods are applicable to the mineral extraction within the district.
- A typical breccia pipe uranium mine produces 3 million pounds of uranium oxide in 231,000 tons of ore, at an average grade of 0.65% by weight.
- The average producing life of an underground breccia pipe uranium mine is two years, with an average production rate of 1.5 million pounds of U_3O_8 per year, compared to, for example, a surface copper mine with a life span of 40-50 years and beyond.
- Modern uranium mining operations are operated under strict regulations enforced by 10 federal and state agencies. The uranium industry has over 40 years of experience in applying international radiation safety regulations at uranium mines, and there are few ill effects for the miners that have been working in such mines.

Uranium is a highly productive fuel. It is easier to understand uranium's high level of efficiency by comparing it to other fuels.

For example, one pound of uranium oxide, known as "yellowcake" (U_3O_8), is equivalent to 35.6 barrels of crude oil (a barrel of oil is approximately 42 gallons).

America's 104 nuclear power reactors provide 20 percent of U.S. electric power—clean-air electricity for one in five homes and businesses.

The estimated Arizona uranium reserves would produce over 375 million pounds of U_3O_8 with an energy equivalence of *13.3 billion barrels of crude oil*— equal to the total recoverable oil in Prudhoe Bay, the largest oil field in North America.

Table of Contents

List of Tables & Figures

Appendix A: Socioeconomic Charts & Graphs

SECTION 1. BACKGROUND & PROJECT INTRODUCTION

Tetra Tech, Inc.[3] (Tetra Tech) has prepared this independent analysis to estimate the potential value derived by mining the uranium contained in 1,069,000 acres in northern Arizona (the Northern Arizona Uranium District, or NAUD) (see Figure 1). Coconino and Mohave Counties are defined as the region of influence (ROI) for this analysis, which assesses the economic impacts to businesses and households in the ROI if these uranium resources were be mined. The report also qualitatively addresses impacts on neighboring counties in Utah and regional mining service centers. The region lying north of the Grand Canyon is generally referred to as the Arizona Strip.

In preparing this analysis, Tetra Tech has relied on projected operations, production, wages and benefits, and employment data provided by the American Clean Energy Resources Trust (ACERT), a consortium of mining companies, and on information from other sources deemed to be reliable, primarily federal agencies.

The Nuclear Fuel Cycle—Mine to End User[4]

Mining

Uranium deposits are found in rocks around the world and in all three major rock types (igneous, metamorphic, and sedimentary). The breccia pipe uranium ore in the NAUD is sedimentary. Uranium ore around the world varies in "grade," which refers to the percentage of mineral found in the rock. Uranium from northern Arizona is the highest grade ore in the United States.

Uranium can be recovered by conventional mining methods of excavation via surface pits or underground mine plans, or by dissolution by fluids pumped down drill holes to the resource. However, because both surface pits and dissolution mining are inapplicable to the Arizona breccia pipe deposits, these deposits would be mined by underground (hard rock) mining methods, with small amounts of water used for dust suppression and underground operations. Underground mining leaves a smaller surface footprint or disturbance. In the case of underground uranium mines, the mine plan addresses three parameters: production, mine ventilation, and roof control. Modern uranium mining operations are operated under strict regulations enforced by 10 federal and state agencies. The uranium industry has over 40 years of experience in applying international radiation safety regulations at uranium mines, and there are few ill effects for the miners that have been working in such mines. Due to advances in safety program management and mine design, U.S. underground mining of all minerals is now one of the safest industrial professions, nearing the safety records for low risk industries such as retail, banking, and insurance.

Milling

When recovered from the breccia pipe, uranium mineralization is contained within rock, which is transported to the mill where the ore is further crushed and then ground to a fine slurry. Sulfuric acid or a strong alkaline solution is used to dissolve the uranium, to allow the separation of uranium from the waste rock. It is then recovered from solution and precipitated as uranium oxide (U_3O_8) concentrate. This concentrated form is sometimes referred to as "yellowcake" and generally contains approximately 90 percent uranium. After drying and usually heating it is packed in 55-gallon drums as a concentrate. Yellowcake is not categorized as a hazardous material.

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[3] Tetra Tech's qualifications are found in Section 9, List of Preparers. This report was commissioned by the American Clean Energy Resources Trust (ACERT), and ACERT has provided some production estimates. However, the report is an independent assessment of the value of the resource and the economic impacts of mining the resource. The report was prepared for use by third parties (legislative bodies and government agencies of the United States, Arizona, and Utah) to assist in policy decisions.

[4] The fuel cycle discussion was adapted from the World Nuclear Association website (WNA 2009a).

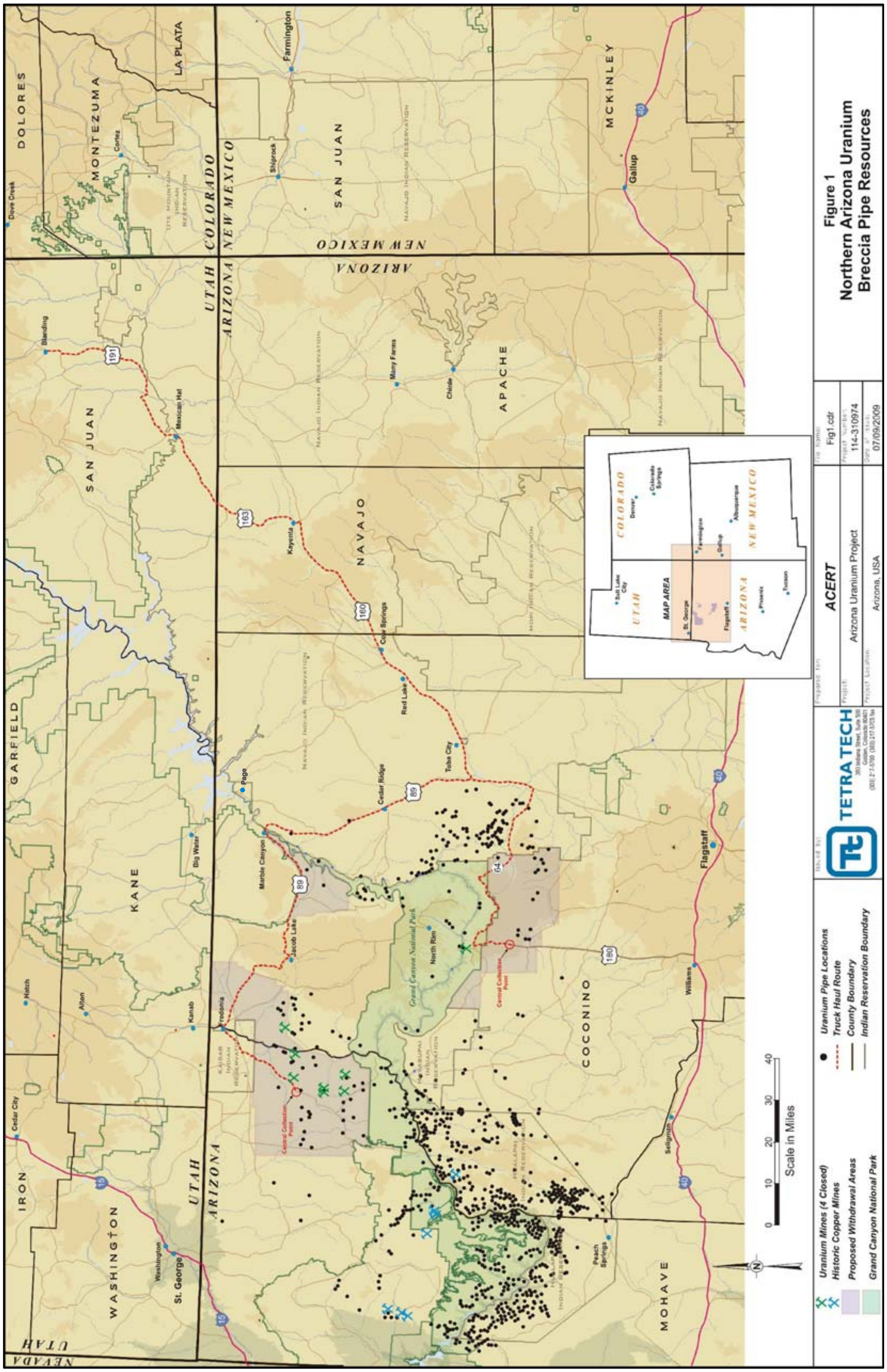


Figure 1. Northern Arizona Uranium Breccia Pipe Resources

Mills cannot separate all of the mineral from the waste. A small percentage (less than 10 percent) of the rock containing uranium, and a large percentage of the rock not containing uranium, exit the mill as waste or tailings. This waste is placed in engineered facilities near the mill. Substantial engineering design goes into the tailings disposal site so that it has long term geotechnical stability and allows for eventual revegetation of original biota (unless the mine permit allows for alternative post-mined land use). The engineering design also ensures that the refuse, which may contain low radioactivity, is isolated from any groundwater and other ecosystems.

Conversion, Enrichment and Fuel Fabrication

The yellowcake is shipped to fuel preparation facilities that further concentrate and convert the uranium to fuel quality. Most reactors use fuel enriched in the U-235 isotope. The solid uranium oxide (yellowcake) from the mine is converted into the gas UF_6, which is then enriched in the U-235 isotope by one of two physical methods of enrichment. *Diffusion* enrichment works by exploiting the different speeds at which U-235 and U-238 pass through a membrane. *Centrifuge* enrichment works by passing the gas through spinning cylinders, with the centrifugal force moving the heavier U-238 to the outside of the cylinder and leaving a higher concentration of U-235 on the inside.

Uranium dioxide pellets are produced from the enriched UF_6 gas. The pellets are then encased in long metal tubes, usually made of zirconium alloy (zircalloy) or stainless steel, to form fuel rods. The rods are then sealed and assembled in clusters to form fuel assemblies for use in the core of a nuclear reactor. The rods are then shipped to nuclear power plants or other end users.

Electricity Generation and Other Uses

Nuclear reactors produce electricity by heating water to make steam. The steam is then used to drive turbines that generate electricity. In this sense nuclear reactors are similar to other thermal power stations, where the heat from burning coal or natural gas is used to produce stream. A key difference of nuclear reactors is that they do not emit carbon dioxide. A nuclear *chain reaction* is so-called because when a U-235 atom splits (or *fissions*) in the reactor's core, the neutrons released cause other uranium atoms to also undergo fission. A moderator slows down the neutrons to achieve this. The nuclear reactor uses control rods to ensure that this chain reaction occurs at a controlled rate.

The U.S.S. Nautilus,
a Nuclear-powered Submarine
[Source: STPNOC Website]

Uranium is also employed in other nuclear applications. Nuclear submarines, a critical part of America's defense, are able to travel long distances without refueling. Nuclear technology is also used in an ever-increasing variety of medical and diagnostic equipment and medical treatment.

Used Fuel Management

Used fuel from a nuclear reactor is first stored to allow most of the radioactivity to decay. Then it is either reprocessed to recover the reusable portion, or disposed of directly as waste. In reprocessing, the used fuel is dissolved and the uranium and plutonium in the used fuel are separated from the waste fission products. Plutonium can then be combined with uranium to make Mixed Oxide Fuel (MOX), which can be used in many modern reactors. Reprocessed uranium can be used in new uranium oxide fuel. No underground facilities have yet been built for used fuel, although several are planned. Low-level nuclear waste has been successfully and permanently stored at the U.S. Department of Energy's Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico since 1996.

Uranium as a Fuel

Fuel Efficiency

Fuels are discussed in terms of the amount of energy they produce, traditionally expressed in British thermal units (BTU or Btu). One Btu is roughly the amount of energy needed to heat one pound of water by one degree Fahrenheit. It is perhaps easier to understand uranium's high level of efficiency by comparing it to other fuels.

One pound of yellowcake (U_3O_8) is equivalent to 35.6 barrels (bbl) of crude oil (a barrel of oil is approximately 42 gallons).

During the 1980s, seven mines in the NAUD produced 19 million pounds of uranium, the energy equivalent of approximately 676 million barrels of oil, with a temporary surface disturbance of less than 20 acres per mine—*an area smaller than a Wal-Mart parking lot*. The mine reclamation left the disturbance nearly undetectable and provided a positive example of environmentally effective mining under the nation's current mining and environmental laws.

The NAUD ore averages roughly 0.65% uranium—generally about five times higher than any other uranium deposits in the United States.

America's 104 nuclear power reactors provide 20 percent of U.S. electric power—clean-air electricity for one in five homes and businesses. Nuclear reactors use uranium measured in *pellets.* One fuel pellet is about twice the size of a pencil eraser (see illustration below). This fuel is so efficient that just one pellet provides as much energy as:

- 149 gallons of oil,
- One ton of coal, or
- 17,000 cubic feet of natural gas.
- Five fuel pellets meet a household's electricity needs for an *entire year*.

During the 1980s and 1990s, six mines in the NAUD produced approximately 20 million pounds of uranium, the energy equivalent of one billion barrels of oil, with a temporary surface disturbance of less than 20 acres per mine—an area smaller than a Wal-Mart parking lot.

The NAUD ore averages roughly 0.65% uranium—generally about five times higher than any other uranium deposits in the country. The average producing life of an underground breccia pipe uranium mine is two years, with an average production rate of 1.5 million pounds U_3O_8 per year, compared to, for example, a surface copper mine with a life span of 40-50 years and beyond.

Shown at left is the Wetlands Waterfowl Sanctuary located at the South Texas Project (STP) Nuclear Generating Station, in Matagorda County, Texas (STP website).

Estimated World Reserves in BTUs

The Energy Information Administration (EIA), which is an agency of the U.S. Department of Energy, and other reliable agencies, have estimated the extent of major worldwide energy sources. These sources are considered as commercially and technically extractable, and are measured in quintillions of Btus, which reflects the amount of heat the energy can generate.

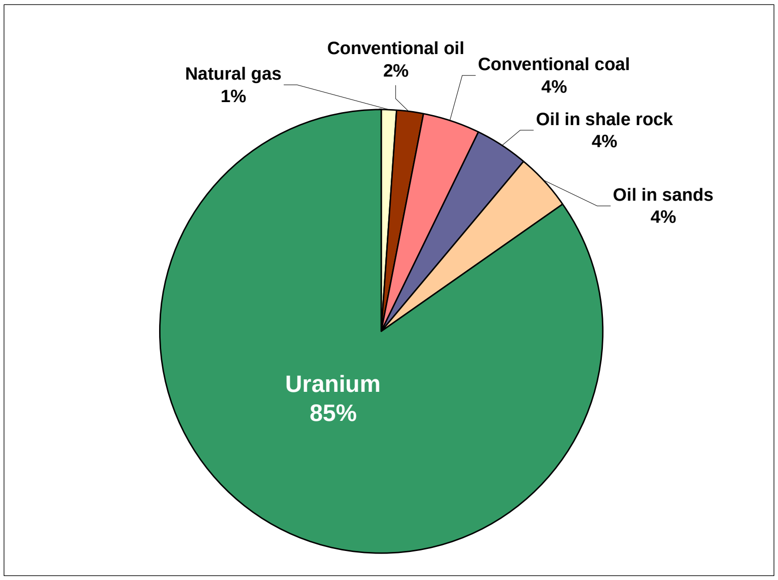
A *quintillion* is a billion billions, or 10^{18} — that's 18 zeros: 1,000,000,000,000,000,000.

Table 1. World BTU Capacity by Energy Source

Energy Type	*Reserves (quintillions of Btus)*	*Percent of Total*
Conventional natural gas	5.5	1.1%
Conventional oil	10.2	2.1%
Conventional coal	19.5	3.9%
Oil in shale rock	19.3	3.9%
Oil in sands	20.9	4.2%
Subtotal, Fossil Fuels	75.4	15.2%
Uranium	420.0	84.8%

Fossil fuels (oil, gas, and coal) were formed millions of years ago from the remains of organic life forms (plants and animals) composed of hydrogen and carbon, and are thus often referred to as hydrocarbon fuels. In terms of Btu capacity, hydrocarbon fuels provide only 15.2 percent of the total, while the world's uranium can produce 84.8 percent of the total—more than five times all hydrocarbon-based fuels together.

In 2005, the world used 0.468 quintillion Btus, and the United States used 0.101 quintillion Btus. At these usage rates, uranium could supply the world's energy for 900 years, carbon-based fuels for 12 years to 45 years.



The World's BTU Capacity by Energy Source

Project Introduction

The U.S. Department of Interior is considering the withdrawal from mineral entry and location approximately 1,069,000 acres of lands that comprise nearly all of the Northern Arizona Uranium District (NAUD) (see Figure 1). The NAUD extends through northern Arizona from the northern Coconino Plateau to the southern Utah border. Uranium mineralization in the district occurs in and around vertical columns of broken and re-cemented rock commonly 200 to 500 feet in diameter, known as collapse breccia pipes. The mineralization is restricted to depths ranging from 1100 to 1,700 feet below the surface and constitutes some of the highest grade U_3O_8 ore in the United States.

The USGS Open File Report (OFR-89-550) shows the mapped locations of 1,296 pipes in and around the NAUD. The study only identifies the location of pipe structures that outcrop at the surface, but subsequent work in the area has demonstrated that breccia pipes can stop upward growth at any stratigraphic level above the Mississippian-aged Redwall Limestone, and many pipes do not reach the surface. If these structures penetrate the Coconino Sandstone in a favorable area within the NAUD they often contain uranium mineralization, but breccia pipes outside of the NAUD are seldom mineralized.

Arizona's uranium was first discovered in 1947, but early production was limited to a single mine.

The northern area contains 40 breccia pipes historically mapped by the U.S. Geological Survey (USGS) in 1989 (USGS Open File Report (OFR) 89-550). Seven of these pipes were mined between 1980 and 1990, yielding 142,000 tons of ore averaging 0.65 percent U_3O_8, which provided about 19 million pounds of U_3O_8. No mines are currently active in the northern area; however, four breccias pipes are in standby mode awaiting mine permitting activities to restart. In addition, field studies have been completed on seven other breccia pipes and are awaiting development activities; and another four pipes have attained discovered status and are awaiting field characterization studies. Finally, numerous other pipes are in the early stage of identification and resource definition.

The Arizona Strip has the highest grade and most profitable uranium production in the US.

From 1980 to 1990, Energy Fuels Nuclear (EFN) mined 1,142,000 tons of ore that averaged 0.65% U_3O_8 from 7 breccia pipes in the NAUD and produced 19 million pounds of uranium. They were some of the last hard rock uranium producers in the US prior to the uranium price decline of the 1990s. No mines are currently active; however, four breccia pipe uranium deposits are in standby mode awaiting mine permitting activities to restart. In addition, field studies have been completed on seven other breccia pipes and are awaiting development activities; and another four pipes have attained discovered status and are awaiting field characterization studies. Finally, numerous other pipes are in the early stage of identification and resource definition.

The Hack Canyon discovery initiated modern exploration in the district.

Uranium mineralization was first discovered on the NAUD in a mineralized breccia pipe in 1947. The uranium occurred in association with copper mineralization at the Orphan mine located two miles west of the visitor's center on the south rim of the Grand Canyon. The first uranium ore was shipped by the Golden Crown Mining Company in 1956 to a buying station in Tuba City. Before closing in 1969, the Orphan operation produced a reported total of 4.4 million pounds of uranium in material averaging 0.42% U_3O_8 and 6.7 million pounds of copper**.** The Orphan mine properties were located on patented claims granted and signed by President Theodore Roosevelt before the establishment of the Grand Canyon Park. The mine was not part of the park until it was purchased by the National Park Service in 1963, and integrated into the Grand Canyon National Park when the mining rights expired in 1988.

The north district has produced >19 million pounds of uranium, averaging 0.65% U_3O_8.

Since the discovery of uranium in the Orphan Mine, extensive field work has been conducted by governmental and private concerns to define the spatial extent of the breccia pipes in the NAUD. This work has included ground and airborne geophysical surveys, mapping of rock exposures in the deep canyons of the area, mapping on aerial photos, shallow and deep hole drilling, electric logging in drill holes, laboratory analysis of drill core, and 2- and 3-dimensional computer modeling. In addition, subsurface data have been obtained from observations and measurements taken in the historic underground mines.

Breccia Pipe Morphology and Origin

The following is a brief description of the morphology and geologic origin of NAUD breccia pipes:

- **Cavern formation**. Groundwater percolating through the sedimentary rocks dissolves the Mississippian-aged Redwall Limestone forming caverns. As the size of the cavern grows, roof rock becomes unstable and collapses into the void, forming a rubble zone. This rubble material is referred to as breccia.
- **Pipe formation**. Natural mechanical and chemical processes continue to weaken the overlying sedimentary rocks, resulting in the collapse zone migrating upwards above the cavern to a vertical distance of 2,000 to 4,000 feet. These resulting pipes have a cylindrical shape, a diameter of 200 to 500 feet, and a funnel-shaped pipe throat if they extend to ground surface. The breccias filling the pipes commonly have calcite or sulfate cement.
- **Uranium mineralization**. Uranium mineralization was deposited in the NAUD breccia pipes 200-260 million years ago. Uranium minerals, mostly pitchblende, are thought to have been transported to the breccia pipes by oxidizing ground water in the Coconino Sandstone, which occurs about 1,800feet above the Redwall Limestone. The ground water first migrated laterally through the sandstone to the breccia pipes, then downward in the more porous and permeable breccias that are surrounded by the non-porous Hermit Siltstone. As the enriched water moved downward, the chemical environment changed from an oxidizing to reducing state, resulting in the precipitation of dissolved minerals such as uranium, copper, iron and numerous other metals in trace amounts. The uranium-enriched zone in the breccia pipe may occur over a vertical distance of more than 600 feet and at depths of 1,100 to 1,700 feet below ground surface, and may contain up to 7 million pounds of U_3O_8.

A generalized breccia pipe geometry is illustrated in Figure 2.

Breccia Pipe Uranium Mine Characteristics

An average breccia pipe mine produces 3 million l of uranium, and has the following characteristics:

- Uranium: 3 million pounds of uranium at a grade averaging approximately 0.65 percent, which is the equivalent of 13 pounds of U_3O_8 per ton of ore.
- Dimensions of the uranium zone: Each breccia pipe has cylindrical uranium ore zone that ranges in size from 200 ft to 500 ft diameter by 100 ft to 600 ft high.”
- Mining method: Modified shrink stoping[5] underground mine plan.
- Haulage: Spiral ramp to shaft.
- Footprint: Minimal mine surface footprint and disturbance.
- Surface waste rock storage: Temporary and restricted to ramp and shaft material. All ore is excavated and shipped to an offsite mill.

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[5] “Stoping” is the removal of the ore from an underground mine, leaving behind an open space known as a stope.

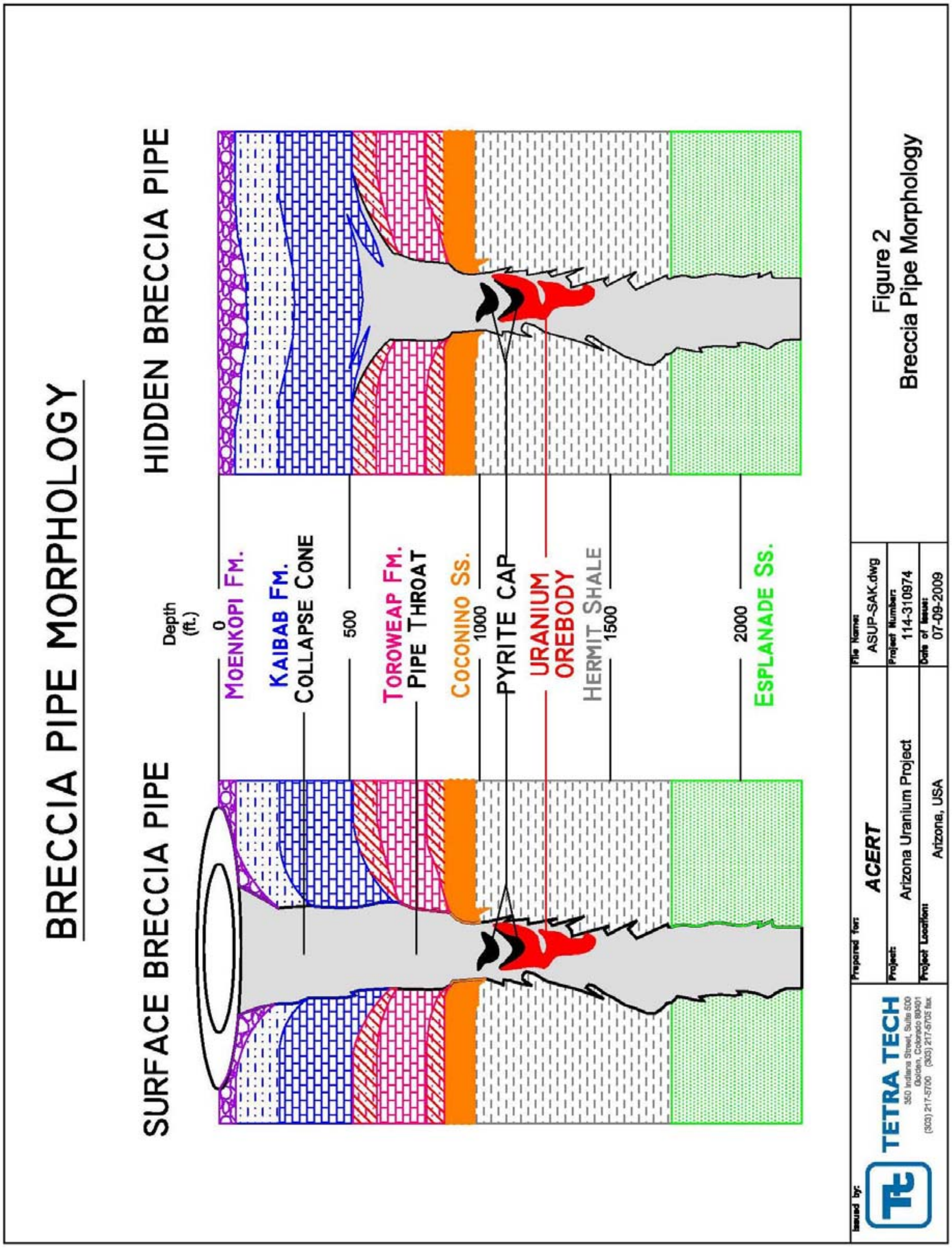

Figure 2. Breccia Pipe Morphology

Breccia Pipe Resources in the Project Area

The U.S. Geological Survey Circular 1051: *The 1987 Estimate of Undiscovered Uranium Endowment in the Solution-Collapse Breccia Pipes in the Grand Canyon Region of Northern Arizona and Adjacent Utah,* gives the 1,069,000 acre area (1,670 square miles) subject to the proposed withdrawal a calculated mean endowment of 112.4 tons of U_3O_8 per square mile and a total mean endowment of 187,690 tons (375 million pounds) of uranium oxide, equivalent to *about 42% of the total uranium resources in the United States*.

As noted above, over 19 million pounds of uranium have been produced since 1980 from the following seven mines in the Northern Arizona Uranium area:

Table 2. A Summary of Energy Fuels Nuclear Mining History on the Arizona Strip

Mine Name	Production Period	Tons Mined	Grade of U_3O_8	Total Pounds U_3O_8
Hack Canyon I	1981-1987	133,822	0.530	1,419,623
Hack Canyon II	1980-1987	497,099	0.704	7,000,273
Hack Canyon III	1981-1987	111,263	0.504	1,121,748
Pigeon	1985-1990	408,794	0.643	5,651,862
Kanab North	1988-1991	260,818	0.531	2,767,570
Pinenut	1988-	25,807	1.020	526,350
Hermit	1989-1990	36,339	0.760	552.449
Total / *Average*		**1,471,942**	***0.647***	**19,039,875**
Source: As reported in the 1998 International Uranium Corporation United States Securities and Exchange Commission Registration Statement.				

The current status of these mines is as follows:

- Hack Canyon I, II and III, Pigeon, and Hermit, owned and operated by Energy Fuels, are mined out and have been reclaimed.
- Kanab North, owned by Denison Mines, is on standby and has remaining mineable uranium reserves.
- Pinenut, owned by Denison Mines, is in the final phases of development, is awaiting permitting to restart production, and has remaining, mineable uranium reserves.
- Canyon, owned by Denison Mines, is in the final phases of development, is awaiting permitting to commence production, and has remaining, mineable uranium reserves.
- Another Denison Mines property, Arizona 1, is developed, awaiting final permitting to start production, and has mineable uranium reserves.

In addition to the developed mines, numerous other deposits have been identified; several are larger than those that are currently being permitted:

- Four deposits have been delineated from surface drilling and require underground development and drilling for final reserve definition. These deposits include EZ-1, EZ-2, Sage and Wate.
- At least 14 additional breccia pipe uranium deposits have been discovered and require additional drilling for resource delineation.
- Numerous other targets have a drill defined structure at the upper Fossil Mountain horizon but require additional deep drilling to define potential mineable targets.

Perhaps most significant to the overall potential of the NAUD, an airborne geophysical survey employing the latest in time domain electromagnetic technology was conducted by Quaterra Resources in March of 2007. The survey investigated 422 square miles; an area representing approximately one quarter of the NAUD. The program identified all of the known breccia pipes in the surveyed area ***and 200 high and moderate priority anomalies with a similar geophysical signature***. Confirmation drilling on the first two airborne anomalies discovered two new mineralized breccia pipes—the first new mineralized pipes in the NAUD in 18 years. If just 30% of these geophysical anomalies are breccia pipe uranium deposits, and a similar density of mineralized pipes can be identified in the remaining un-surveyed portion of the district, the final endowment of the NAUD may significantly exceed the 375 millions estimated by the USGS.

Figure 3. Kanab North Mine, Mohave County, Arizona

SECTION 2. URANIUM PRICING & DEMAND

This section presents information regarding projected uranium prices and demand.

Uranium Pricing

Two key organizations, the U.S. Energy Information Administration and the World Nuclear Association (WNA) have provided an outlook for uranium demand. In its newly released *Annual Energy Outlook, 2009*, the EIA reports the following. The U.S. nuclear industry's purchase demand for power generation was 51 million pounds of U_3O_8 in 2007, and 53 million pounds for 2008. In 2008, 14 percent of the demand was supplied by US mines, 42 percent from Australian and Canadian mines, and the remaining 44 percent was from other countries (Russia 23%, Kazakhstan 7%, Uzbekistan 4%, Namibia 7%, and South Africa 2%). For the period from 1994 to 2008, the U.S. purchase demand grew at an average rate of 2.4 percent per year. The report further states that for the 50-year period from 1980 to 2030, U.S. uranium power purchase demand, including both actual through 2008 and forecast to 2030, will grow at an average rate of 2.5 percent per year. For the past 50 years, by comparison, the U.S. gross domestic product has grown at an average annual rate of 3.2 percent (adjusted for inflation) (EIA 2009).

The World Nuclear Association, in its *WNA Nuclear Century Outlook*, uses a "low case" and a "high case" approach to forecast nuclear electrical power capacity from 2008 to 2030. Under the low case, capacity will grow between 99 gigawatts (GW) and 120 GW, at an average annual growth rate of 0.88 percent. Under the high case, capacity is projected at 180 GW, at an average annual growth rate of 2.75 percent (WNA 2009b).

Given these forecasts, this impact study assumes that the price of U_3O_8 in 2009 dollars will grow from its present price of approximately $52 per pound of U_3O_8 (as of July 2009) by at least 0.9 percent per year. This yields the following price predictions:

2010	$52.00
2015	$54.40
2020	$56.85
2025	$59.50
2030	$62.20

Although conservative when compared to many economic analyses of 2008 and other "high" cases, these prices represents a foundational level. In estimating the impact to the NAUD, further conservatism was applied by using a constant price of $50 per pound. These assumptions avoid overstating the expected benefits of uranium mining on northern Arizona and surrounding areas.

Uranium Demand

Studies by the USGS and private companies have determined that approximately 375 million pounds of U_3O_8 equivalent are contained in the uranium lands that could be removed from the NAUD mining opportunity that was made available by the Mining Act of 1872 and reaffirmed by the *Arizona Wilderness Act* of 1983. In 2008, the U.S. nuclear electrical power industry purchased 53 million pounds of uranium at an average price of $45.88 per pound. For the period 2009 through 2030, the median projection for uranium purchase demand is anticipated to increase by an annual average rate of 1.82 percent per year. This growth rate is the average of the low and the high electrical demand cases described above. Table 3 contains a projection of future world uranium demand for power generation, assuming this growth rate. These conservative assumptions by EIA and WNA are based on the expectation that no large unforeseen changes occur in power generation technology, alternative fuel sources, nuclear policy, or geopolitical conditions.

Table 3. Projected World Uranium Demand

Year	World demand (millions of pounds)	World Additional demand (millions of pounds)
2008	114.0	0.0
2015	129.4	60.3
2020	141.6	112.9
2025	154.9	177.4
2030	169.6	247.9
Total	709.5	598.5

The total quantity through 2030 for world incremental uranium purchase demand is 599 million pounds. It is assumed that the NAUD can capture 50 to 65 percent of the 599 million pounds of incremental demand, or 300 million to 375 million pounds, thus reducing U.S. dependence on foreign sources, some of which could be unstable or even hostile to the U.S.

This production assumption is based on the following:

- The NAUD has demonstrated historical fundamental conditions that result in low mining cost and resource extraction; shallow access, high ore grade, and low capitalization. These factors place the NAUD toward the lower end of the supply cost curve—i.e., more efficient to produce—as compared to other U.S. uranium resource areas, which include the Gas Hills in central Wyoming, the Grants area of New Mexico, Texas, and western Colorado; and place the NAUD prominently in the world supply profile.
- Non-mining sources of uranium include spent fuel reprocessing and sales of decommissioned nuclear weaponry uranium into the power industry. Because of cost and technological barriers, these sources do not represent threats of supply substitution of NAUD fuel.

Figure 4. Reclaimed Hack Canyon Mine

SECTION 3. PROJECT AREA

This report assesses the impact of potential uranium mining operations on the economies of Coconino and Mohave Counties, Arizona, which comprise the study area (region of influence, or ROI) for this analysis (see Figure 1). Three adjacent counties in Utah could also be affected by this project. It is possible that some mine workers would reside in neighboring Kane County, where the community of Kanab is one of the nearest population centers to the northern Arizona mining sites. Uranium mined in northern Arizona would be milled in San Juan County, near the town of Blanding, at an existing facility. Some mine servicing support would come from St. George and Washington, in Washington County along Interstate 15. Impacts to the Utah counties are addressed qualitatively, along with impacts to other areas, Arizona, and the United States.

Table 4 presents a summary of indicators for the two ROI counties in Arizona, the adjacent Utah counties, and the two states (see Appendix A for graphics illustrating socioeconomic trends). In 2008, all five counties showed growth over 2000 populations. In Arizona, whose statewide growth was 26.7 percent during that period, Coconino County grew by 10.5 percent and Mohave County by 26.6 percent. Note that the major population centers in both of these geographically large counties are in the southern portions of the county. Coconino County contains the cities of Flagstaff (county seat and largest city) and Sedona, as well as the towns along the Grand Canyon’s South Rim. Mohave County contains Kingman (county seat) and the cities along the Colorado River, Lake Havasu City (largest city) and Bullhead City.

Table 4. Project Area Overview

	Arizona			*Utah*			
	Statewide	**Coconino County**	**Mohave County**	**Statewide**	**Kane County**	**San Juan County**	**Washington County**
Est. Total Population, 2008[a]	6,500,180	128,558	196,281	2,736,424	6,577	15,055	137,589
% Change from 2000 Census	26.7%	10.5%	26.6%	22.5%	8.8%	4.5%	52.3%
Population Density per sq. mi.	45.2	6.2	11.6	27.2	1.5	1.8	37.2
Labor Force, 2008[b]:	3,132,667	73,433	93,421	1,383,743	3,528	5,079	62,495
Employment, 2008	2,960,199	69,679	86,918	1,336,156	3,387	4,773	59,639
Avg. annual unempl. rate, 2008	5.5%	5.1%	7.0%	3.4%	4.0%	6.0%	4.6%
Unempl. rate, May 2009	8.0%	6.3%	9.1%	5.2%	4.7%	7.4%	6.7%
Per Capita Income, 2007 ($)[d]:	$32,833	$31,855	$23,908	$29,831	$29,663	$17,170	$24,014
PCI as % of US PCI[a]	85.0%	82.5%	61.9%	77.3%	76.8%	44.5%	62.2%
Percent of population living below poverty, 2007	14.1%	16.2%	13.5%	9.8%	9.4%	31.6%	8.9%

[a] USCB 2009a. Population density is an area’s population divided by its area.

[b] BLS 2009a. The May 2009 unemployment rate represents preliminary (unadjusted) data.

[c] BLS 2009b. “Empl” = employment; “unempl” = unemployment.

[d] BEA 2009a. “PCI” = per capita income. The data are the latest available.

In Utah, population increases of 8.8 and 4.5 percent occurred in Kane and San Juan Counties, respectively, between 2000 and 2008, while Washington County experienced a population increase of 52.3 percent, and Utah’s statewide growth was 22.5 percent.

Coconino and Mohave Counties have population densities well below the state average of 45.2 persons per square mile, with densities of 6.2 and 11.6, respectively. Washington County has 37.2 persons per square mile, exceeding Utah’s statewide density of 27.2, but Kane and San Juan are very sparsely populated, with densities of only 1.5 and 1.8, respectively (USCB 2000a).

The northern portions of both counties are in an area known as the “Arizona Strip,” which is separated from the southern part of the state by the Grand Canyon. The area is characterized by small communities some distance apart, with no large towns. The nearest population centers to prospective mine locations north of the Grand Canyon are the small communities of Fredonia and Page, in Coconino County, Arizona, and Kanab, in Kane County, Utah. The prospective mining locations south of the Grand Canyon are less isolated from population centers, and workers could come from more populated areas such as Williams or Flagstaff. Characteristics of these communities are discussed in more detail below.

Figure 5. Aerial View of Kanab, Kane County, Utah

The population of the project area is largely white (Caucasian) except in San Juan County, where Native Americans comprise 56.3 percent of the population. In the remaining counties, Native Americans are the predominant minority, ranging from less than 1 percent of the population in Kane County to 27.7 percent in Coconino County. A portion of the Navajo Nation lies within San Juan County, and Coconino County is home to a portion of the Navajo Nation and the Hopi Indian Tribe. Statewide, Native Americans comprise 4.5 percent of Arizona’s population and 1.2 percent of Utah’s, compared to 0.9 percent nationally (USCB 2000a).

Per capita income (PCI) is total income divided by total population and is a useful measure to compare regions, even though it does not explicitly capture regional differences in cost of living. The PCI varied substantially across the project area, with San Juan County, UT having a PCI of only 44.5 percent of national levels. The highest PCI was for Arizona statewide, closely followed by Coconino County (BEA 2009a).

As of 2007, the national percentage of individuals living below poverty (“poverty rate”) was 13 percent. Arizona and Mohave County were only slightly above the national poverty rate, while Coconino County was somewhat higher and San Juan County was substantially higher, with a rate of 31.6 percent. The poverty rate in Utah statewide and in Kane and Washington Counties was somewhat lower than the national average.

The average 2008 unemployment rates in Mohave County, AZ, and San Juan County, UT, were slightly higher than the national average rate of 5.8 percent, and somewhat lower in the other three counties. By May 2009, following several months of recession and job loss across the nation, all five counties had seen increases in unemployment, but only Mohave County equaled the national unemployment rate of 9.1 percent (BLS 2009a).

The economies of the ROI and adjacent counties in Utah area are reasonably diversified, according to 2007 data (BEA 2009b). The ROI is more typically urban due to the presence of Flagstaff, with the Services sectors accounting for 40.6 percent of jobs, followed by Retail Trade (13.3 percent), Construction (8.6 percent), and Manufacturing (5.1 percent). Diversification in the ROI is very similar to Arizona as a whole. The three Utah counties, however, reflect a somewhat more rural diversification, with Services accounting for only 30.9 percent of jobs, followed by construction (14.0 percent), Retail Trade (12.6 percent), and Local Government (7.5 percent). When Washington County is excluded, however, the Services sector accounts for only 18.8 percent of jobs in Kane and San Juan Counties, more typical of a very rural area. (Note that much of the employment data for these two counties have not been disclosed by the BEA, so it is difficult to assess the exact level of diversification.[6])

Table 5 presents data on the communities within or near the project area. The larger towns or those south of the Grand Canyon—Flagstaff, Sedona, Williams, and St. George—experienced strong population growth between 2000 and 2007. These communities also host tourists for the Grand Canyon, Zion National Park, and other well-known scenic attractions that draw tourists from around the world.

Table 5. Population Trends and Housing Costs, Project Area Communities

	Population[1]			Median Home Value, 2000[2]
	July 1, 2007 Estimate	Census 2000 (April 1, 2000)	% Change, 2000-2007	
Arizona towns				
Flagstaff (Coconino County)	59,746	52,894	13.0%	$161,000
Fredonia (Coconino County)	1,096	1,036	5.8%	$77,900
Page (Coconino County)	6,904	6,809	1.4%	$138,600
Sedona (Coconino County)	11,471	10,192	12.5%	$253,700
Williams (Mohave County)	3,270	2,842	15.1%	$100,300
Utah towns				
Blanding (San Juan County)	3,185	3,162	0.7%	$86,500
Kanab (Kane County)	3,769	3,564	5.8%	$106,100
St. George (Washington County)	71,161	49,663	43.3%	$143,200

[1] USCB 2008a, 2008b. Data for 2007 are the latest available for sub-county entities.

[2] USCB 2000b. Dollars are 2000, not adjusted for inflation to 2009.

Growth in the Arizona Strip communities and in Kane and San Juan Counties has been more modest. Fredonia grew by 5.8 percent between 2000 and 2007, while Page grew by only 1.4 percent. Kanab, the county seat and largest town in Kane County, grew by 5.8 percent between 2000 and 2007.

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[6] County or other small area data may not be disclosed when data do not meet BLS or State agency disclosure standards regarding confidentiality or data quality. For example, if there are few firms in an area, data users could determine or approximate a firm's total payroll, hours worked, and other information that a firm may not want known to its competitors.

The San Juan County seat of Monticello[7] saw its population almost unchanged, while Blanding, the county's largest city, grew only slightly. However, St. George City, Washington County's seat and largest city, grew by 43 percent. (USCB 2000a, 2008a; 2008b).

Median home values (owner-occupied homes, as recorded in the 2000 Census) vary across the project area, as Table 5 shows. By comparison, Arizona's median home value was $121,300, Coconino County's was $142,500, and Mohave County's was $95,300. In Utah, the statewide median home value was $146,100, while it was $103,900 in Kane County, $68,400 in San Juan County, and $139,800 in Washington County. The national median home value was $119,600. Although it is expected that most of the mining labor force would be drawn from local residents, Kanab, Fredonia, and Williams have median home values well under the national and state averages, suggesting that any incoming workers could readily find affordable housing.

The city of Sedona, south of the project area and divided between Coconino County and Yavapai County, is a major tourist and retirement center. As Table 6 shows, Sedona's median home value in 2000 was substantially higher than communities closer to the project area and the county and state values. These high home values suggest that much of Coconino County's wealth may be concentrated in the southern portion of the county.

Figure 6. Fire Station in Fredonia, Arizona

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[7] The town of Monticello, located north of Blanding, is considered too far from the prospective NAUD mine sites for its labor force to be employed in the possible mines. However, any increases in the amount of uranium processed at the White Mesa Mill in Blanding would lead to greater employment opportunities for residents of Monticello, Blanding, and the surrounding areas.

SECTION 4. METHODOLOGY & DEFINITIONS

This section presents Tetra Tech's assumptions and methodology in preparing this report, and describes certain taxes that can be affected by mining production.

Regional Input-Output Multipliers

In performing this analysis, Tetra Tech used the Regional Input-Output Modeling System (RIMS II) developed by the Bureau of Economic Analysis (BEA), U.S. Department of Commerce (BEA 2009c). RIMS II is widely used in both the public and private sectors for economic impact analysis. In the public sector, for example, the Department of Defense uses RIMS II to estimate the regional impacts of military base closings. State agencies use RIMS II to estimate the regional impacts of various projects such as new highways and airport construction and expansion. In the private sector, analysts and consultants use RIMS II to estimate the regional impacts of a wide variety of activities and programs such as tourist expenditures, opening or closing manufacturing plants, shopping mall development, and new sports stadiums.

RIMS II measures the economic impact of a business operation by using location-specific multipliers to determine the total output, earnings, and employment generated within a geographic region. The RIMS II multipliers reflect three types of economic impact:

- Direct impact represents the initial value of goods and services purchased by the subject business operation;
- Indirect impact represents the value of goods and services purchased by local companies to provide goods and services demanded by the subject business operation; and
- Induced impact measures the change in local household spending patterns resulting from increased earnings by employees in local industries producing goods and services for the subject business operation.

RIMS II multipliers are based on a national input-output table, which is adjusted to reflect a region's industrial structure and trading patterns. Industries are defined according to the North American Industry Classification System (NAICS) (USCB 2009b). Economic sector Mining (NAICS 21) includes oil and gas extraction and all types of mining, quarrying, and support activities. This report focuses on Sector 21, Mining.

RIMS II multipliers are available for any region composed of one or more counties. However, if an economic sector is not currently present in a county or region, a multiplier may not be available to estimate impacts resulting from increases in that sector. For this reason, this analysis uses a multiplier based on Montrose County, Colorado, which is similar to the project ROI and where uranium mining is present.

To assess the impacts of uranium mining operations on the ROI's economy, the multipliers for Industry 2122A0, Gold, Silver, and Other Metal Ore Mining, were applied to estimated sales, wages and benefits, and employment data provided by the American Clean Energy Resources Trust, a consortium of mining companies.

Data

All statistical data used in this analysis are the latest available that provide comparable, consistent, and reliable information for the geographic area under consideration.

Projected uranium production, wages and benefits, and employment data have been provided by ACERT members.

ACERT and Tetra Tech approximated potential total sales dollars using projected production and predicted prices for Arizona uranium. The pricing methodology is discussed above and is based on predictions by the EIA and WNA.

Tax Definitions

Several types of taxes are relevant in analyzing the impacts of potential uranium mining operations to the economies of Coconino and Mohave Counties and other areas. Some non-payroll taxes are listed below, with a brief definition.

- Property Tax (*ad valorem* or "according to value"), a county-levied tax on property.

  Purpose: to compensate government for the cost of services based on the value of real and personal property. Flows into the economy by County action.

- Sales and Use Tax, a State- and local-levied tax on sales of tangible personal property at rates ranging from 2.9 percent to 8.0 percent, based on local options.

  Purpose: to finance the operations of local and state governments. Flows into and out of the economy by state and local action.

- Severance Tax, a state levied tax on extracted minerals equal to 2.5 percent of 50 percent of the difference between the gross value of production and the production costs. The tax applies to all lands from which minerals are extracted, regardless of the land's ownership.

  Purpose: to compensate present and future citizens for the loss of natural resources from the land by individuals and corporations that make a profit by using up the irreplaceable natural wealth of a state. Flows back into and out of the economy by state action.

- Arizona State Corporate Income Tax, a State-levied tax on income, 6.968 percent of net income; deduction allowed for depletion, but not for Federal income taxes.

  Purpose: to finance the operations and capital improvement for state government. Flows into and out of the economy by state action.

- Federal Corporate Income Tax, a Federally-levied tax of 35 percent for taxable income over $18,333,333, with a sliding scale.

Federal, state, and local governments may also levy other taxes and fees based on production and other factors.

Mine workers who are Utah residents would pay Utah personal income tax. Any mine or worker purchases made in Utah would be subject, as applicable, to Utah sales and use taxes.

SECTION 5. ESTIMATED OUTPUT IMPACT ANALYSIS

Operating Scenario Assumptions

The economic analysis is based on the following operating scenario assumptions for the NAUD, which are premised on the USGS and private evaluations identifying the uranium resources in the area, as discussed in Section 1 of this report.

The 126 projected mines, divided into 3-mine "sets," would be developed and mined under a "rolling" schedule that extends over 42 years. Operations would include the following activities over a 5-year cycle for each set of mines: planning and permitting (Year 1); development, and installation of machinery and infrastructure (Year 2); production (Years 3 and 4); and reclamation (Year 5). Except for the first three years and the last two years of the 42-year period, two sets of mines (six mines) would be in production during any given year.

This rolling schedule approach has several advantages. First and foremost, the 42-year schedule would ensure a long-term, stable workforce in the project area, avoiding the undesirable "boom-and-bust" impacts, typical of many large projects, in which a large, short-term influx of workers can stress communities. The project's longevity would allow local workers to work many years in an industry that provides higher-than-average wages and benefits. Workers who moved into the area would bring their families and settle into the community, contributing to the long-term healthy growth of local communities, and strengthening the local tax base and the expansion of services. Suppliers and other businesses could feel confident about opening or expanding in the project area, given the long-term nature of the project.

Allocating production over a long duration would also minimize any impacts related to transportation of machinery and ore, thus reducing traffic and the wear and tear on the transportation network. Finally, the long-term nature of the project and the rolling schedule means that at any one time, operations in the NAUD would be fairly small in scale, thus avoiding the commitment of a large portion of available infrastructure resources (equipment, for example) to the NAUD effort. Such a capture of resources for one project could harm other mining operations in the region, the U.S., and even internationally.

Impact Analysis

This section estimates the impacts to the local economy from operations at the breccia mines. As such, the analysis encompasses:

- The mining companies' projected sales;
- Purchases of goods and services by the mining companies from local businesses ("suppliers");
- Sales of goods and services by other local businesses to the local and area suppliers; and
- Sales of goods and services to employees of these companies and to mining workers;

In performing this analysis, we have used the RIMS II multipliers as described in Section 4. RIMS II measures the economic impact of a business by using location-specific multipliers to determine the total output generated within a geographic region.

To determine the total estimated output impact of the mining operations on Coconino and Mohave Counties (the ROI), Tetra Tech used the RIMS II output multiplier specific to NAICS Sector 2122A0, Gold, Silver, and Other Metal Ore Mining; this multiplier of 1.5560 indicates that each

$1.00 of sales by the mine operators would generate an additional $0.5560 in sales for other local businesses (BEA 2009c). Applying this multiplier yields the results shown below.

Table 6. Estimated Output Impact Analysis

Component	Total Sales ($ Millions)
Direct – Mining Companies[1]	$18,900
Indirect – Other local businesses	$10,508
Total	$29,408
Duration of production (years)	*42*
Average Annual Total Impact	$700

[1] Direct output estimates were projected by ACERT members.

Estimated annual sales from the projected uranium mining operations could total approximately $18.9 billion over the 42 production years of the project. Application of the BEA multiplier predicts that additional sales generated by other businesses as a result of the mining operation's impacts on the local economy could be as much as $10.5 billion, yielding a total estimated output impact for the ROI of up to $29.4 billion. The average annual impact to the area could be as much as $700 million, and would represent a substantial beneficial impact to residents of the local counties and the State of Arizona, and would benefit adjacent areas as well.

A typical uranium mine in Arizona requires a minimum of $23 million of equipment for mine site surface and underground equipment (see Figure 7). The equipment is powered by electro-mechanical and diesel drive trains. A mining operation employs sophisticated maintenance planning systems to realize the lowest cost.

An integral part of cost effective mining is the presence of third party maintenance support and parts inventory near the operations areas, to avoid production delays, unscheduled shutdowns for maintenance, and subsequent loss of revenues. Mines also use consumables such as tires, fuel, explosives, and lubricants; construction support; and miscellaneous parts and services.

The mining companies have projected expenditures of $21 million for mining labor, materials, and supplies; $8 million for trucking the ore to Blanding Utah; and $23 million to process the ore at Blanding. To the greatest possible extent, the mine operators' policy would be to use local contractors and suppliers to obtain services and supplies needed in its operations, thus maximizing the impact to Coconino and Mohave Counties and neighboring areas. The company would use local providers to obtain materials from national suppliers, thus allowing a portion of those expenditures to remain within the ROI and surrounding areas, directly benefitting the local economy.

Figure 7. Typical Uranium Drilling Equipment

Economic Impact on Neighboring Counties

The uranium mining operations would be dispersed around Coconino and Mohave Counties, which would receive the primary economic benefit. However, the economic influence of these operations could also extend to other areas, including Kane, San Juan, and Washington Counties, Utah, to the north (see Figure 1). Goods and services could also be obtained from Flagstaff (in Coconino County) and other metropolitan areas, such as Grand Junction and Denver, Colorado; Farmington, New Mexico; and Salt Lake City and other Utah cities.

Mine workers residing in the neighboring counties, and the mine's purchases of goods and services from larger towns outside of the ROI, would generate additional impacts beyond the ROI. This report does not analyze those impacts in detail. However, to partially assess these effects, Tetra Tech collected employment data from the Bureau of Labor Statistics (BLS) for the ROI, Arizona, the neighboring Utah counties, Utah, and the United States (see Table 7). All data shown are for private sector employment only (government jobs are excluded).

Within the project area, Sector 21, Mining (which includes support activities) accounts for a noticeable share (7.9 percent) of total employment only in San Juan County, which is home to a uranium mill. In the remaining project area, mining accounts for less than 1 percent of total jobs (BLS 2009b). In Arizona, mining jobs make up 0.5 percent of the total, and in Utah, 1.1 percent of jobs. Data for the mining sector were not disclosed for Kane County.

Table 7. Private Sector Employment and Wages, 2007, Coconino and Mohave Counties and Comparison Areas

	Total, All Industries[1]		Sector 21, Mining		Sector 21 as % of Total Empl.	Sector 21 as % of Total Wages
	Empl.[2]	*Total Wages ($000)*	*Empl.*	*Total Wages ($000)*		
United States	114,012,221	$5,057,540,759	660,276	$54,154,901	0.6%	1.1%
Arizona	2,248,274	92,267,716	11,449	$714,865	0.5%	0.8%
Coconino Co.	44,842	1,394,924	91	$3,092	0.2%	0.2%
Mohave Co.	44,857	1,332,253	153	$6,109	0.3%	0.5%
Utah	1,024,330	37,555,611	11,034	$749,990	1.1%	2.0%
Kane Co.3	2,437	56,935	(ND)	(ND)	N/A	N/A
San Juan Co.	2,585	66,808	205	$10,534	7.9%	15.8%
Washington Co.	46,840	1,337,093	307	$7,041	0.7%	0.5%

[1] All data are for private sector firms only.

[2] Empl. = Employment (number of jobs) located in each area.

[3] (ND) = Non-disclosed (do not meet BLS confidentiality criteria). N/A = not applicable.

Source: BLS 2009b. Data for 2007 are the latest available at this level of disaggregation.

Data in these counties for the industry subsector including uranium mining were not available or were not disclosed due to confidentiality concerns (USCB 2009b). In every area but Washington County, Sector 21 wages reflect a higher percentage of the total than the employment numbers for those sectors, revealing that this industry pays higher than average wages.

The 2000 Census collected information regarding residents' employment by industry sector (later data are not available for these counties). Tetra Tech used these data to assess the number of mining workers residing in the area. As Table 8 shows, only in San Juan County were more than 1 percent of the resident labor force employed in the mining sector.

Table 8. Civilian Labor Force And Mining Employment by Residence, 2000

	Arizona			Utah			
	State-wide	Coconino County	Mohave County	State-wide	Kane County	San Juan County	Washington County
Total civilian labor force (residents over age 16)	2,233,004	55,510	60,517	1,044,362	2,666	4,235	35,646
Total employed in Sector 21, Mining	10,746	218	140	8,151	11	141	56
as % of total employment	0.5%	0.4%	0.2%	0.8%	0.4%	3.3%	0.2%

Note: This table shows the number of each area's residents who work in the mining sector (regardless of where the jobs are located). By contrast, Table 7 shows the number of jobs located in each area, by sector, and does not consider the residence location of the workers.

Source: USCB 2000b. These are the latest data available at this level of disaggregation.

The White Mesa Mill at Blanding, in San Juan County, is the only operating facility of its type in the United States. In 1980, the mill began processing uranium ore that contained nominally 0.3 percent or greater U_3O_8 ore into yellowcake uranium concentrate containing 90 percent U_3O_8. Since its opening, the mill has been owned by several companies, and it is currently owned by Denison Mines Corporation (DMC) of Toronto, Canada. The mill also recovers vanadium as a by-product (DMC 2009a). Figure 1 shows the mill's location; Figure 8 is an aerial view of the mill.

The capacity of the mill between 1980 and 2008 was 2,000 tons per day (tpd) of raw ore feed. In April 2008, a $31 million expansion and modernization program was completed. According to local newspapers, the mill's employment has ranged from approximately 103 employees in 1985 to 150 employees in 2007 (*Deseret News* 1985; *Telluride Watch* 2007). Current employment is about 150 when the mill is in full operation (DMC 2009b).

Based on the projected NAUD mining operations production of up to 375 million pounds over 42 years, the existing White Mesa Mill would have adequate capacity to support the NAUD projection. This proposed production would ensure the continued operation of the White Mesa Mill, along with the substantial benefits the Mill provides to San Juan County, Utah, and its residents, and would maintain the economic opportunities for suppliers in Blanding, the surrounding areas, and the region.

Figure 8. White Mesa Mill, Blanding, Utah

Regional and National Impacts

Grand Junction, Colorado, with an estimated 2007 population of 48,425, is 425 miles northeast of NAUD and is a major regional support center for the mining and oil & gas industry. Mining support vendors located there include two general mining parts warehouses, and parts warehouses for major mining equipment manufacturers.

Farmington, New Mexico, with an estimated 2007 population of 42,425, is 275 miles east of the NAUD. It is also a major regional support center for the mining and oil & gas industry.

Other suppliers for the uranium mining operations could be found in major metropolitan areas of the region, such as Denver and Salt Lake City.

Other major beneficiaries of NAUD production would include trucking companies. Historically, mining companies in the western United States have faced the need to haul ore and waste long distances to mills, railheads, and disposal sites. This need has been driven by the effect of diverse topography, lower population density, the absence of alternative transportation, and other factors. In the case of the NAUD, the raw ore extracted from the breccia pipes would be trucked to the White Mesa Mill at Blanding, Utah. The Blanding area is not served by railroads.

Mining companies have historically employed third-party trucking firms for efficiency and cost savings. The economic impact is local, as contract firms typically hire personnel and build service shops such that the truckers and trucks return to home base at the end of every shift. For 375 million pounds of U_3O_8 over a 42-year period, the total ore to be transported would equal nearly 29 million tons, generating about $1.6 billion in today's dollars for trucking firms, long-term stable employment for their workers, and a steady stream of revenue for their suppliers. As with most of the economic impact involved in the NAUD mining, these dollars would build the local economy, contradicting the paradox that exists in so many resource-rich areas, where the economic development impact leaves the area with the raw material.

Yellowcake, the output of the processing mill, is shipped to converters and refiners in 55-gallon drums that weigh an average of 800 pounds. Drums are shipped to conversion plants, where the yellowcake is ultimately converted to fuel for nuclear power plants. An average truck shipment contains approximately 40 drums, or 17.5 tons of yellowcake. This shipping would also generate revenues for trucking firms and their suppliers, as described above. As noted previously, yellowcake is not categorized as a hazardous material for shipping purposes.

Other beneficiaries would include mining equipment companies; equipment suppliers for items such as tires; oil companies; and a host of other firms that employ workers across the United States, in areas far removed geographically but not economically from Arizona.

Other Local Impacts

In addition to their economic contributions, uranium mine company workers residing in the area would contribute to the well-being of the area through their companies' environmental and safety efforts, from workers and their families volunteering and participating in local activities, and from company efforts in and donations to the community.

Reclamation of the mine sites as shown in Figure 9 becomes a source of pride to the local communities and residents.

Figure 9. Reclaimed Pigeon Mine, Northern Arizona

Fiscal Impacts

It is estimated that in addition to the benefits described above, various levels of government would collect the following additional revenues over the 42-year life of the project:

- $2 billion in federal and state corporate income taxes
- $168 million in state severance taxes
- $9.5 million in claims payments and fees to local governments.

Figure 10. Hermit Mine, Northern Arizona, During Operations (Above) and After Reclamation (Below)

SECTION 6. ESTIMATED EARNINGS IMPACT ANALYSIS

The estimated earnings impact analysis measures the wages and benefits that could be received by households in the local economy. As such, it encompasses:

- Wages and benefits projected to be paid by uranium mining companies;
- Wages and benefits that would be paid by local businesses providing goods and services to mining companies ("suppliers");
- Wages and benefits that would be paid by other local businesses selling goods and services to suppliers; and
- Wages and benefits that would be paid by local businesses providing goods and services to the employees and families of all these companies.

To determine the total and annual average estimated earnings impact of the mining operations on Coconino and Mohave Counties (the ROI), Tetra Tech used the RIMS II earnings multiplier specific to NAICS Sector 2122A0, Gold, Silver, and Other Metal Ore Mining; this multiplier of 1.5751 indicates that each $1.00 of sales by the mine operators would generate an additional $0.5751 in sales for other local businesses (BEA 2009c). Applying this multiplier yields the results shown below.

Table 9. Estimated Earnings Impact Analysis

Component	Total Annual Earnings During Full Employment (approximately 38 years) ($ Millions)
Direct – Mining Companies[1]	$25.64
Indirect – Other local businesses	$14.74
Total	$40.38

[1] Earnings are based on employment projections by ACERT members and a weighted average annual wage of $65,741 (Infomine 2009).

The direct spending on local wages and benefits for potential NAUD mining operations is projected to total over $25.6 million annually during the years when all activities are underway (roughly 38 years of the 42). Additional wages would be generated by other businesses as a result of the mine operations; this impact on the local economy is estimated to total over $14.7 million annually, yielding a total earnings impact for the ROI at an estimated $40 million annually. Impacts would be somewhat lower during the initial years of the proposed project, before production begins, and at the end, when all that remains is reclamation of the final sets of mines.

Note that it is likely that some mine workers, especially in the Northern Tract, could reside in Kane County, Utah, and possibly in San Juan County as well. Much of the indirect impact would be tied to the counties where the workers actually reside, since this is generally where they shop and obtain services. For this reason, some of the indirect earnings impact would occur within Kane and San Juan Counties, and impacts to Coconino and Mohave Counties would be slightly overstated.

Uranium mining companies actively participate in their local communities.

The photo above shows visitors to the ACERT booth at Western Legends Week in Kanab, UT.

At right is the mining companies' poster for the event.

Preserving our western heritage

PROVIDING CLEAN ENERGY FOR OUR FUTURE

Quaterra Resources Inc.,
Denison Mines (USA) Corp.,
Energy Fuels Resources,
VANE Minerals (US) LLC,
Uranium One Exploration USA

Congratulations to our compadre,
Lyle Heyborne, 2008 Western Legends Honoree!

Quaterra Resources Inc.
DENISON MINES
uraniumone investing in our energy
VANE Holdings Plc
Energy Fuels Resources

Figure 11. Western Legends Week, Kanab Utah: ACERT Poster and Booth Photo

SECTION 7. ESTIMATED EMPLOYMENT IMPACT ANALYSIS

The estimated employment impact analysis measures the number of jobs that could be generated and sustained in the local economy. As such, it encompasses:

- Persons that would be employed by uranium mine operators;
- Persons that would be employed by local businesses providing goods and services to mining companies;
- Persons that would be employed by other local businesses selling goods and services to the local businesses providing goods and services to mining companies; and
- Persons that would be employed by local businesses providing goods and services to the employees of all these companies.

To determine the total and annual average estimated earnings impact of the mining operations on Coconino and Mohave Counties (the ROI), Tetra Tech used the RIMS II earnings multiplier specific to NAICS Sector 2122A0, Gold, Silver, and Other Metal Ore Mining; this multiplier of 2.7642 indicates that each NAUD uranium mining job would generate an additional 1.7642 jobs in the ROI (BEA 2009c). Applying this multiplier yields the results shown below.

Table 10. Estimated Employment Impact Analysis

Component	Number of Jobs During Full Employment (approximately 38 years)
Direct – Mining Companies[1]	390
Other local businesses	688
Total	1,078

[1] Employment projections were supplied by ACERT members and are based on projected mine employment of 65 persons per mine and two sets of 3 mines each (6 mines) operating per year. It is assumed that when production is complete on one set of mines, the same mine personnel would move on to the next set of mines.

Annual employment was estimated to be 390 workers (65 workers per mine[8] and 6 mines operating per year), with an additional 688 jobs to be created by other businesses as a result of the mining operations. The employment impact on the local economy is estimated to total 1,078 jobs. However, as noted above, it is likely that some mine workers could reside in Kane County or San Juan County, Utah, and that some of the indirect employment increases could occur in those counties. As noted above, impacts would be somewhat lower during the initial years of the proposed project, before production begins, and at the end, when all that remains is reclamation of the final sets of mines.

Although this is a relatively small increase over existing employment in the ROI counties, these well-paid jobs would provide substantial employment opportunities to residents in the less populated and more remote areas of the Arizona Strip and adjacent areas of Utah.

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[8] The job total includes miners, geologists, engineers, managers, and other professional and support staff.

Conclusion

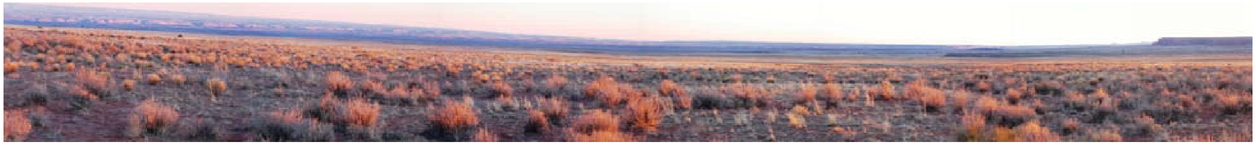
The NAUD represents an important domestic supply of low-cost uranium of the highest grade in the United States, which consumes approximately 50 million pounds of uranium annually. Only 12 percent of the U_3O_8 used by U.S. nuclear power plants was U.S.-origin uranium, while 88 percent was of foreign origin. The NAUD uranium endowment is estimated to produce over 375 million pounds of U3O8 with an energy equivalence of 13.3 billion barrels of crude oil — equal to the total recoverable oil in Prudhoe Bay, the largest oil field in North America.

Mining the lands proposed for withdrawal in the NAUD would produce significant economic benefits to the local area, to Arizona and Utah, and nationally:

- 1,078 new jobs in the project area
- $40 million annual impacts from payroll
- $29.4 billion in output impacts over the 42-year life of the project
- $2 billion in federal and state corporate income taxes
- $168 million in state severance taxes
- $9.5 million in claims payments and fees to local governments
- $1.6 billion to trucking firms transporting ore
- Continuation of 150 jobs at White Mesa Mill in Blanding, San Juan County, Utah, and the indirect jobs those workers support
- Increased business for regional and national mining support vendors
- Increased property taxes for local governments
- Increased state and local sales taxes

The proposed project’s 42-year schedule would ensure a long-term, stable workforce in the project area, and businesses could feel confident about opening or expanding in the project area. The environmental cost of the NAUD mining would be low. The breccia pipe mines have a small footprint and a two-year life, and after reclamation, formerly mined areas are undetectable.

In short, uranium mining in northern Arizona would allow the United States to secure an important domestic source of fuel while providing significant economic benefits with minimal environmental impacts.



View of the “Arizona Strip”

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SECTION 9. LIST OF PREPARERS

About Tetra Tech, Inc.

Tetra Tech is a leading provider of specialized consulting and technical services, offering infrastructure and environmental services to public and private sector clients. Our technical consulting services include research and development, applied science, engineering and construction management, operations and maintenance, and restoration and remediation. Founded in 1966, Tetra Tech has more than 10,000 employees located in 275 offices worldwide.

Tetra Tech's mining group provides geological, geotechnical, environmental, and mine engineering services to the mining industry. Our technical mining expertise includes research and development, applied science, engineering design, construction management, operations support, and site reclamation—supporting sustainable mining throughout the complete mine life cycle. Tetra Tech is also experienced in supporting economic and socioeconomic analysis related to mine feasibility studies and impact analysis.

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APPENDIX A. SOCIOECONOMIC CHARTS AND GRAPHS

Section 3, Project Area, describes social and economic characteristics of the Region of Influence (ROI), surrounding areas, and comparison regions. This appendix presents charts and graphs illustrating selected characteristics discussed in Section 3.

List of Figures

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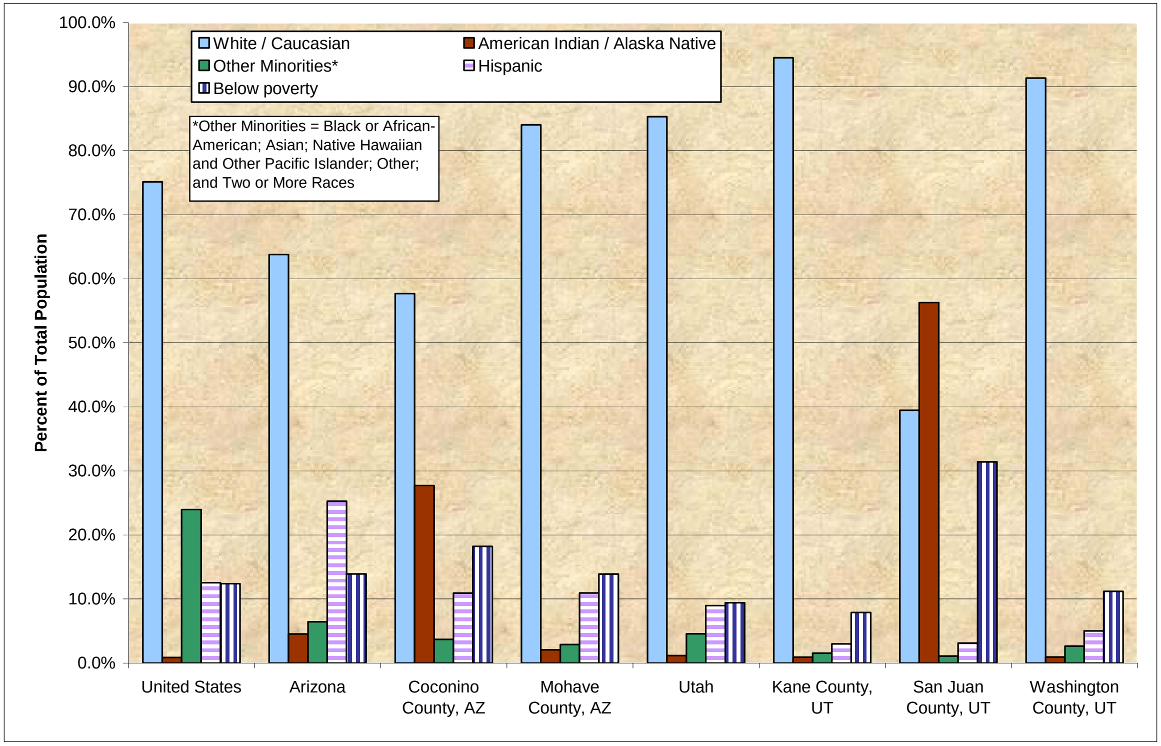


*Other Minorities = Black or African-American; Asian; Native Hawaiian and Other Pacific Islander; Other; and Two or More Races

Figure A-1. Demographic Characteristics of Project Area and Comparison Regions, 2000

Note: White, American Indian, and Other Minorities sum to 100 percent. Hispanics may be of any race, and thus are not included in the total for racial categories. Below Poverty is a separate characteristic that is also not part of the 100 percent.

Source: USCB 2000a; USCB 2000b

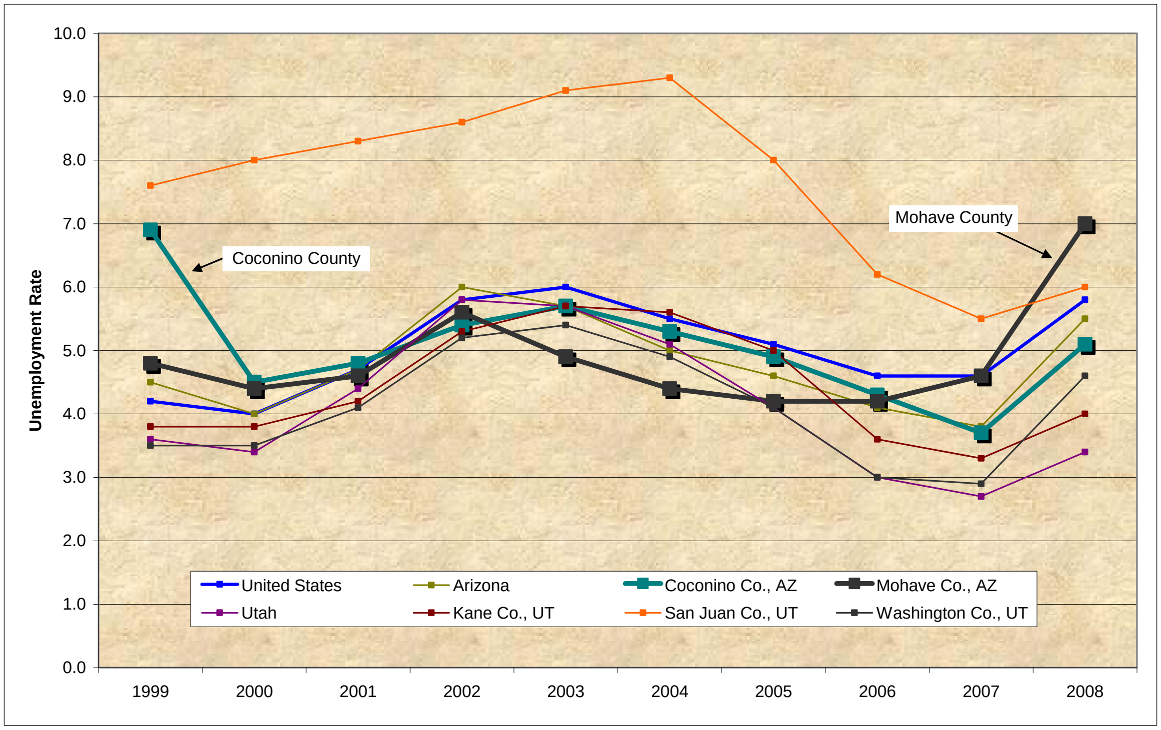
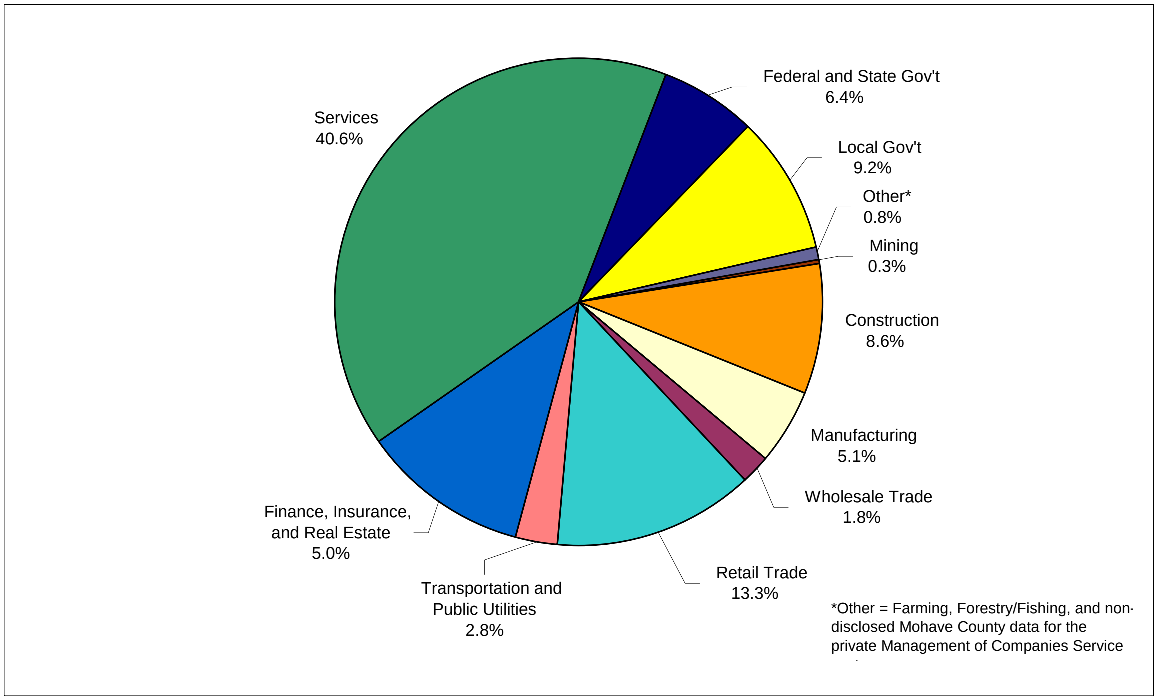


Figure A-2. Unemployment Trends in Project Area and Comparison Regions, 1999-2008

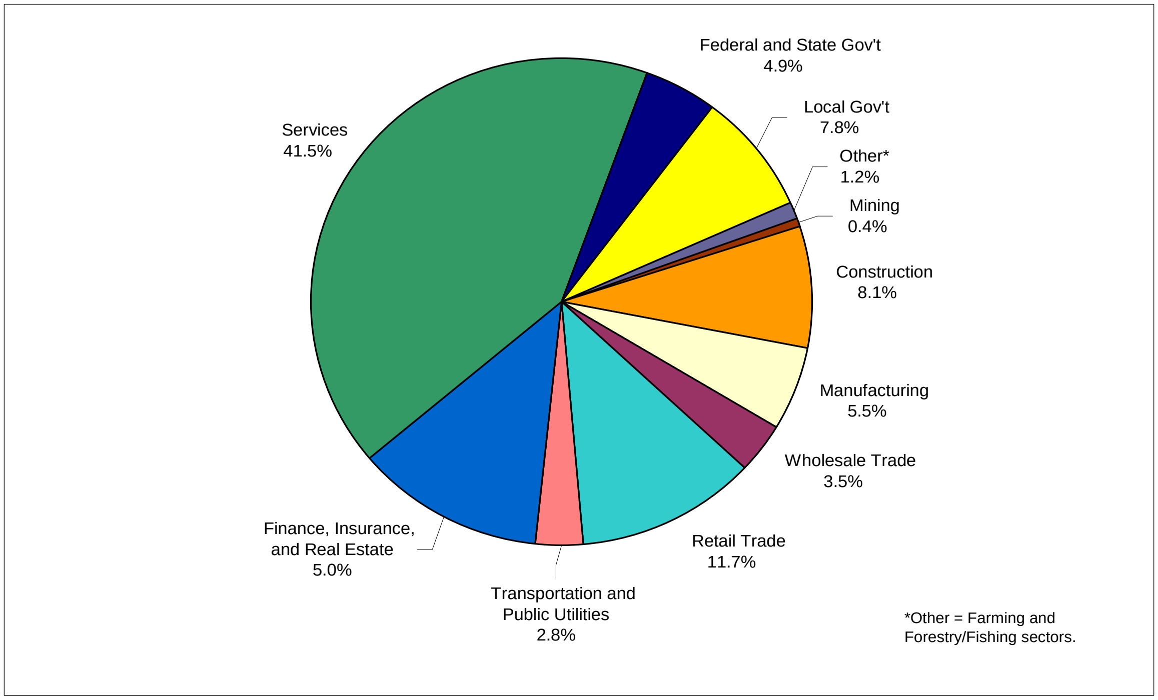
Source: BLS 2009a



*Other = Farming, Forestry/Fishing, and non-disclosed Mohave County data for the private Management of Companies Service

Figure A-3. Employment by Industry, Coconino and Mohave Counties, Arizona, 2007

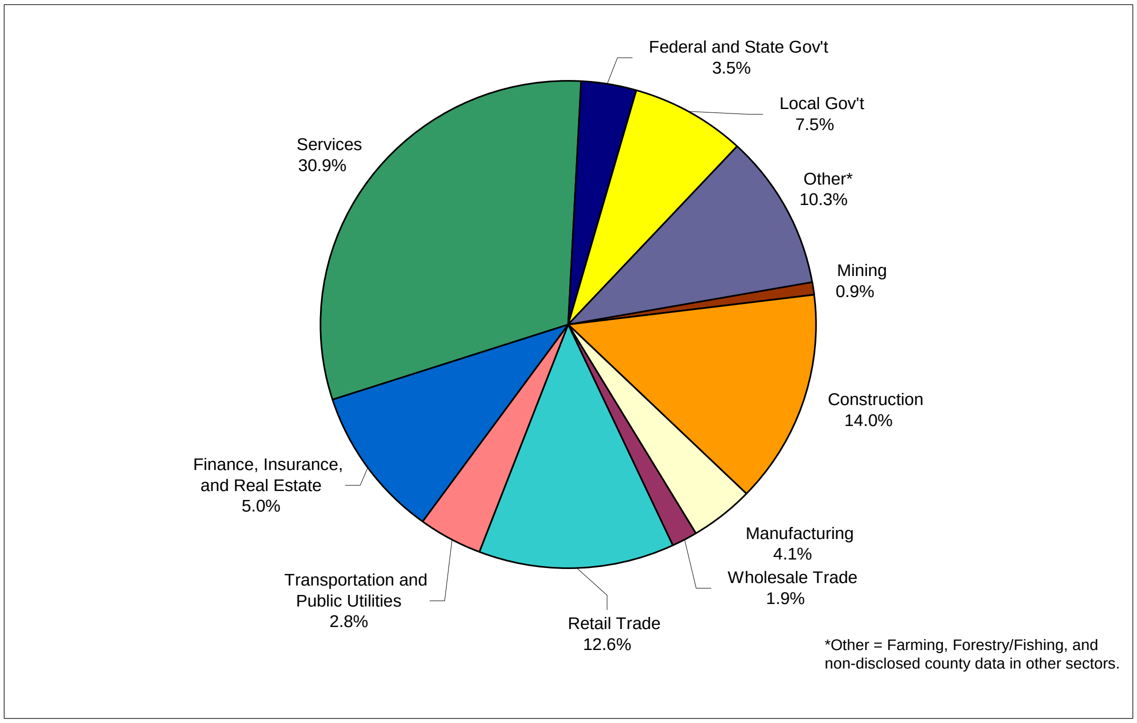
Source: BEA 2009b



*Other = Farming and Forestry/Fishing sectors.

Figure A-4. Employment by Industry, Arizona, 2007

Source: BEA 2009b



*Other = Farming, Forestry/Fishing, and non-disclosed county data in other sectors.

Figure A-5. Employment by Industry, Kane, San Juan, and Washington Counties, Utah, 2007

Source: BEA 2009b

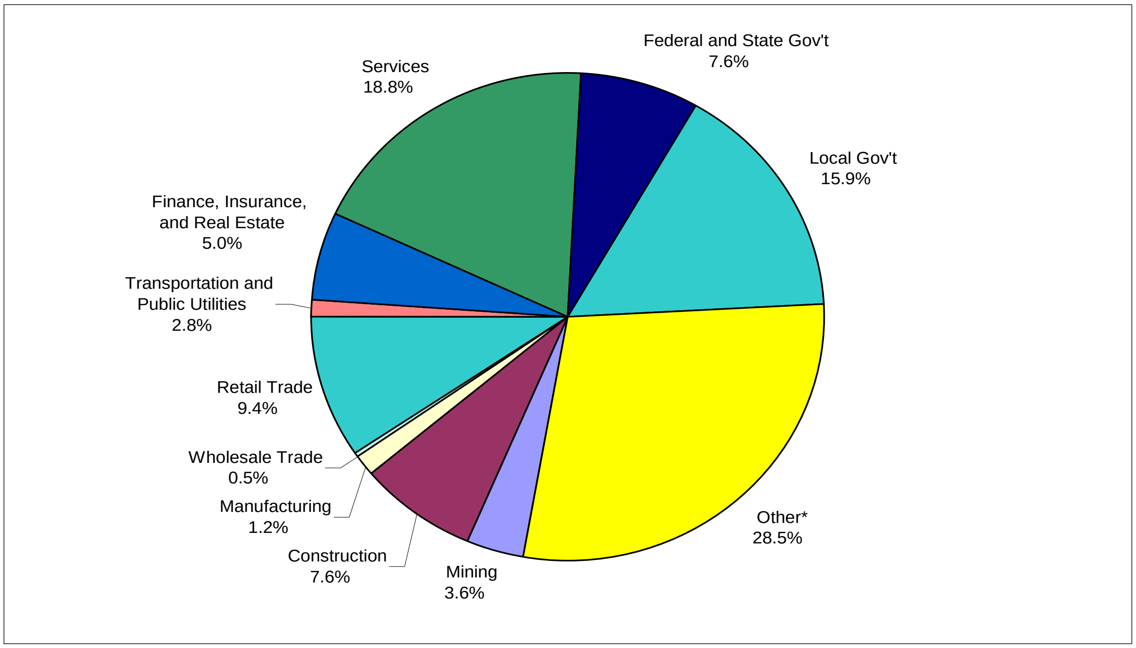


Figure A-6. Employment by Industry, Kane and San Juan Counties alone, 2007

Source: BEA 2009b

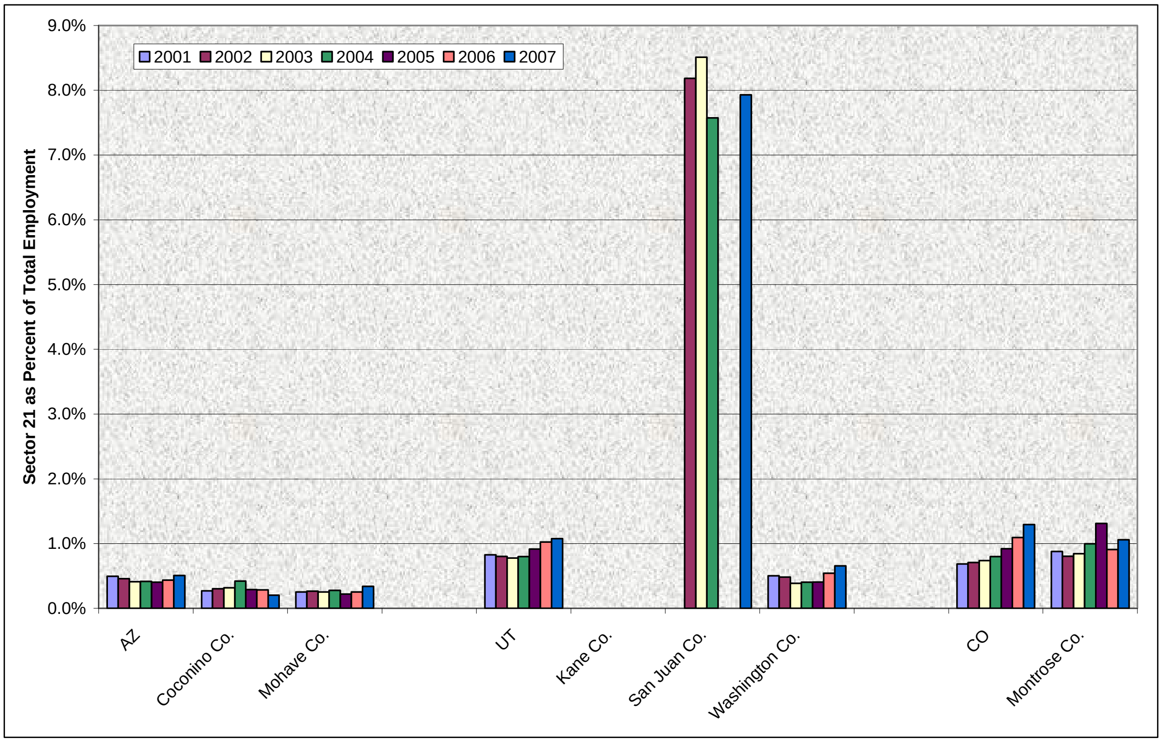


Figure A-7. Sector 21, Mining, as Percent of Total Private-Sector Employment, 2001-2007

Note: This chart is based on the location of the job, regardless of where the worker lives.

Source: BLS 2009b

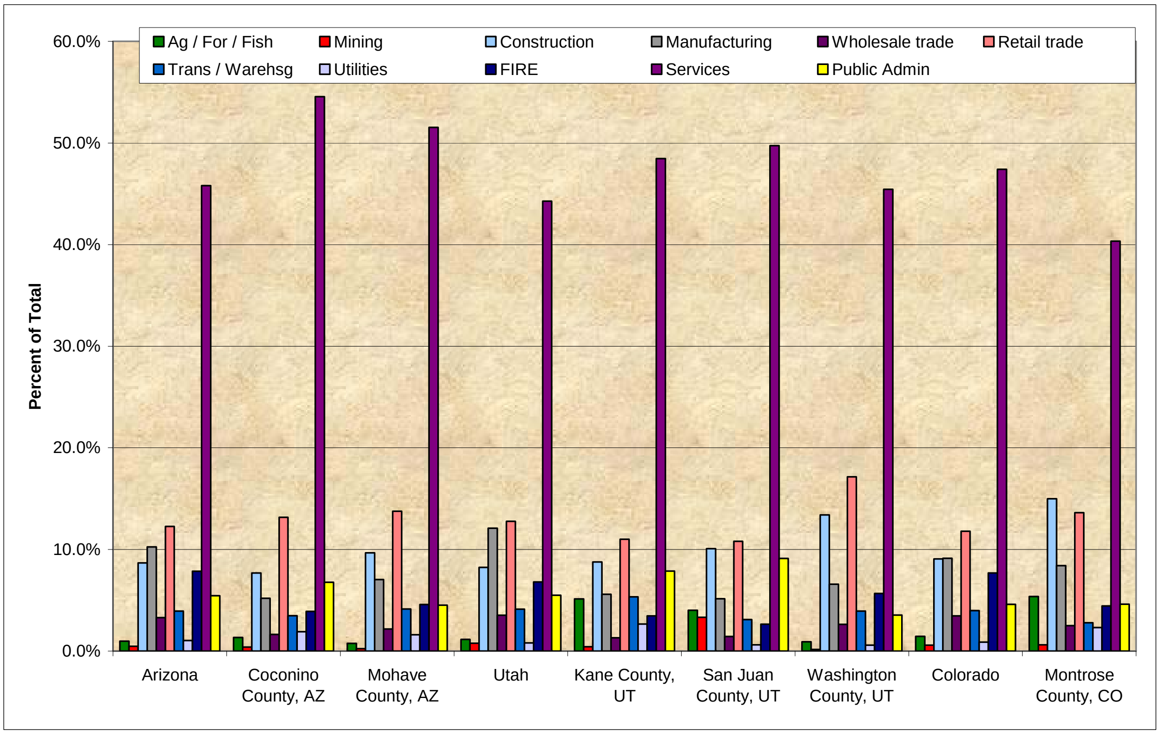


Figure A-8. Sector Employment by Residence, 2000

Note: This chart is based on the residence of the worker, regardless of the location of the job. Later data are not available.

Source: USCB 2000b

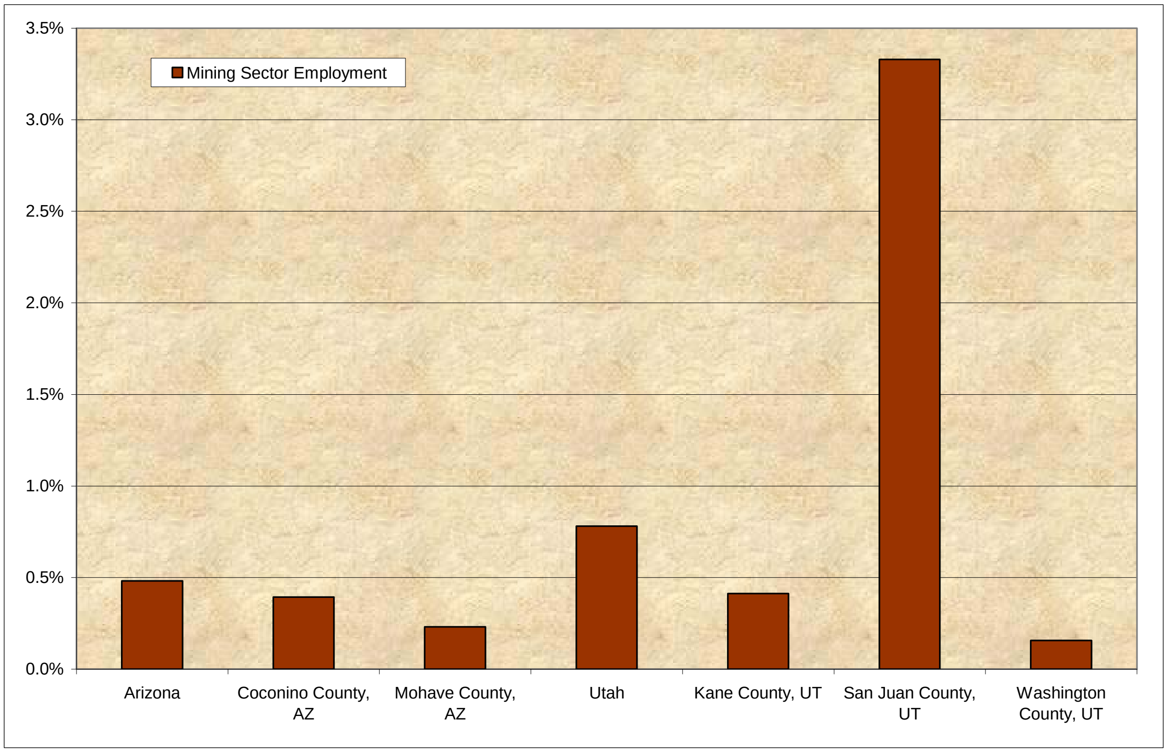


Figure A-9. Mining Sector Employment by Residence, 2000

Note: This chart is based on the residence of the worker, regardless of the location of the job. Later data are not available.

Source: USCB 2000b

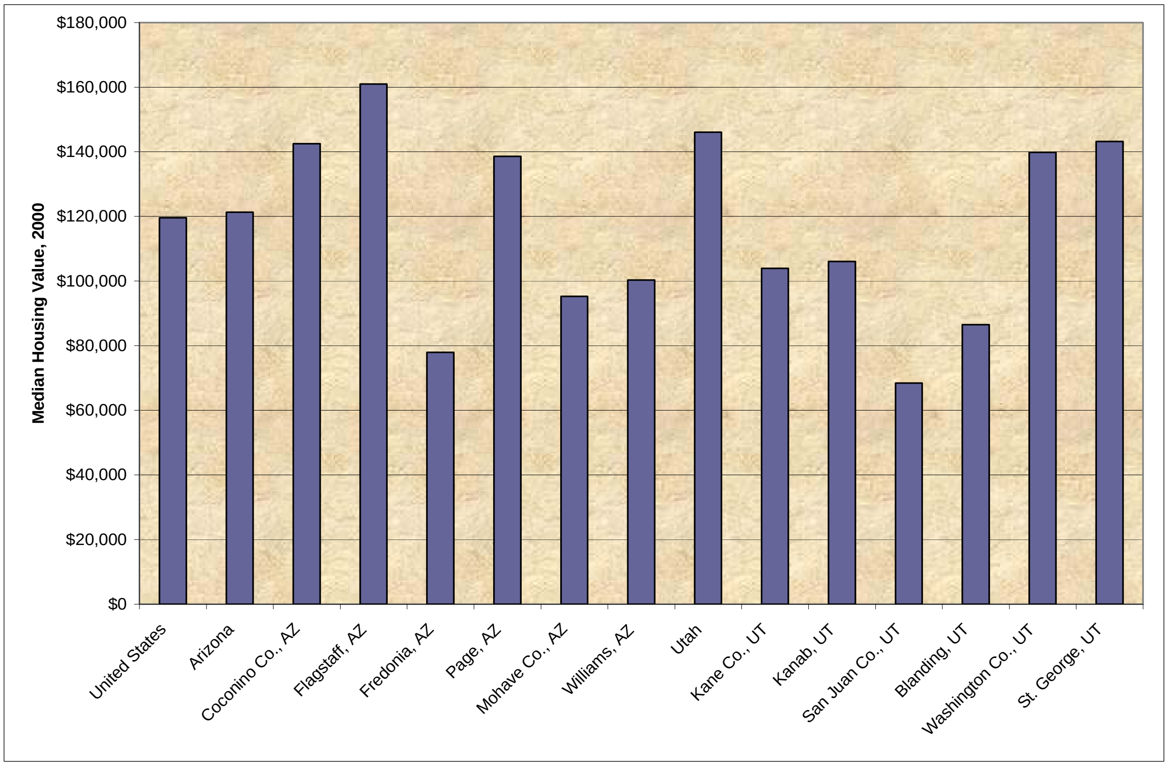


Figure A-10. Median Housing Value, 2000, Project Area and Comparison Regions

Source: USCB 2000b

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Preliminary Evaluation of Metal Contamination Sources in the Colorado River from Measurement of Lead and Uranium Isotopic Ratios.

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Project Summary

The Colorado River is contaminated with low levels of potentially toxic elements, including uranium (U) and lead (Pb). The river is used both as a source of drinking water and a source of irrigation water for food crops. Accumulation of these metal elements into food crops is a health concern, as potential carcinogens or as causal agents of human organ dysfunction. We currently have little or no information on sources of these metals to the Colorado River or other source contributions to food crops irrigated with this water. The objective of this project was to gain preliminary information on possible sources of U, Pb, and other metals to the Colorado River, as well as sources to food crops produced in the region. The U content of the Colorado River increased from <0.05 μg/L at the headwaters near Grand Lake, Colorado, to values greater than 3 μg/L after descending onto the Colorado Plateau. Water diverted for municipal use and irrigation in the lower basin had U concentrations from 3 to 5 μg/L. Preliminary data collected in this study show the use of radiogenic isotopes are a promising tool for understanding contaminant sources and sinks within the Colorado River Basin. Although we did not sample on a spatial scale to rule out temporary local contamination, or on a temporal scale to rule out transitory plumes, the isotope data (U, Sr, and Pb) in the main channel of the Colorado River are generally consistent with the normal weathering of U containing geomedia within the watershed and rule against major contamination from U mines or tailings. Continued measurements should be made such that a baseline can be established before future mining activity commences or accidental release occurs. Both irrigation water and P fertilizers are potential sources of U to food production systems in the lower Colorado River region (LCRR). However, estimates of potential total uranium exposure from all food crops produced in the LCRR are estimated to be less than 2% the RfD, regardless of age and gender.

Introduction

The Colorado River is contaminated with low levels of heavy metals. It has been estimated that 20 million people use the Colorado River as a drinking water source. In addition, approximately 4.2 million-acre feet (about 5 billion m^3) are annually diverted at Imperial Diversion Dam near Yuma, primarily for the irrigation of food and feed crops. The production of fresh market fruit and vegetables in the lower Colorado River region (LCRR) is approximately a two billion dollar industry. Fruits and vegetables produced in this region are distributed nationally and internationally. We currently have little or no information on sources of these metals to the Colorado River or the level of contributions of these metals to food crops irrigated with this water.

Renewed emphasis on alternative energy sources has revived interest in uranium (U) mining on the Colorado Plateau. The Colorado River which transects and drains the plateau is used both as a source of drinking water and a source of irrigation water for food crops. Therefore the potential for mine waste and runoff into the Colorado River requires an understanding of current U concentrations, sinks, and sources.

Uranium is a health concern as a potential carcinogen and endocrine disruptor as well as a causal agent of kidney dysfunction. Human exposure to U can be through dermal contact, inhalation, or ingestion through water or food. Based on a national survey it was reported that the intake of U in a typical diet is 1.75 μg/day (Welford and Baird, 1967). The kidney is a recognized target organ for U toxicity. Effects have been observed in both studies with laboratory animals (Gilman et al., 1998) and humans (Zamora et al., 1988; Wilkinson, 1986, Health Canada, 1998). The U.S. Environmental Protection Agency has established a maximum contaminant level (MCL) for natural U of 30 μg/L (USEPA, 2000). Based on more recent clinical and epidemiological evidence the State of California has set the Public Health Goal (PHG) for U at 0.5 μg/L (OHHEA, 2001). The USEPA has established a reference dose of 3 μg/kg body weight (bw)-day and that recommended by the WHO is 0.6 μg/kg-bw-day.

In natural environments, U isotopes include ^{238}U (99.3%), ^{235}U (0.71%), and ^{234}U (0.006%). Natural U is found in granites, metamorphic rocks, lignite, monazite sands, phosphate deposits and other geological materials, including sediments and soils (Zhang et al. 2002). The Colorado River has detectable levels of U and it has been alleged that one significant source may be the abandoned Atlas mill site near Moab, Utah (American Rivers, 2004). While there is an urgent need to stabilize this site near Moab (DOE, 2004), it is neither the only nor the most significant source of U to the Colorado River.

The Colorado River has concentrations of Pb lower than that of U, but a prolonged drought has created conditions for enhanced lead exposure through runoff and dust from abandoned mines and desiccated sediment deposits. Lead has multiple toxic effects on the human body (ASTDR, 1990). Non-carcinogenic effects include decreased intelligence in children (Needleman, 1982; Hutton, 1987; Bellinger et al, 1992; Canfield et al., 2003), increased blood pressure in adults (Schwartz, 1991), kidney impairment, and reproductive effects (Chowdhury et al., 1984). Long-term accumulation of Pb in the biosphere, including human tissue, has resulted largely from anthropogenic activities, particularly mining and leaded gasoline. Gasoline, as a Pb source has declined with the adaptation of unleaded gasoline (OEHHA, 1997). The average concentration of Pb in adults and children is 100 times greater than the natural encumbrance, and existing rates of Pb absorption are 30 times the level in pre-industrial society The biotic exposure problem is increased significantly in the southwestern US, where arid conditions and episodic torrential rainfall produce barren, highly eroded mine sites. Drought has also resulted in significant shrinkage of reservoirs (such as Lake Powell and Lake Mead) and drainage areas (such as the Salton Sea), exposing Pb laden sediments to wind dispersion. Other sources of Pb to the environment include smelters, refiners, and paint products. Surveys in the United States have found Pb soil levels ranged from 10 mg/kg to 700 mg/kg (Shacklette et al., 1971; Lovering, 1976). Lead concentrations in the Colorado River water are generally less than 2 μg/L, but concentrations in suspended sediments can be as high as 40 μg/g (USGS, 2004).

Isotopic ratios can be used to discern metal sources. Lead is the natural byproduct of U and Th decay and has three radiogenic daughter isotopes: ^{208}Pb, ^{207}Pb, and ^{206}Pb. When ratioed to each other or to the one non-radiogenic isotope, ^{204}Pb, these isotopes provide a useful discriminator of contaminants. Unlike other stable isotopes (N, C, O, S), Pb isotopes do not fractionate through natural surficial processes, which makes them ideal for “fingerprinting” differing sources. This approach has been used successfully to investigate sources of atmospheric deposition of Pb (Spencer et al. 1995; Kober et al. 1999), sources of Pb contamination in marine environments (Elberling et al. 2002), and transport of Pb contaminants in river systems (Mackenzie and Pulford 2002; Monna et al. 1995). In addition, Pb isotopic ratios in lichens have identified sources of particulate matter in the Southwest (Getty et al. 1999) and analysis of otoliths (ear bones) has identified distinct anthropogenic sources of Pb in marine fish (Spencer et al. 2000). Importantly, even though the use of radiogenic isotopes in biological systems is relatively new, both methodology and understanding are well founded in the geologic community (e.g. Patterson et al. 1955, Patterson 1965).

In addition to Pb, the radiogenic isotope, ^{87}Sr, is a decay product of ^{87}Rb, whereas ^{86}Sr is is non- radiogenic and remains constant over time. The variation of Sr isotopes in seawater over time (Hess et al., 1986; Veizer, 1989) provides information about the origin of sedimentary rocks. The ^{87}Sr/^{86}Sr ratio in surface waters reflects the geology of the areas drained (Banner, 2004; Goldstein and Jacobsen, 1987; Palmer and Edmond, 1992). The ratios along the course of the Colorado River are well defined in the literature (Clow et al., 1997; Gross et al., 2001; Spencer and Patchett, 1997) and reflect the geology of the watershed and the mixing of various tributary contributions. Significant deviations from the expected ratios are a potential marker of anthropogenic contributions.

The paired isotopic composition of lead and strontium should be related to the geologic context of their source area. By integrating our chemical results with the geologic framework of individual tributaries and the Colorado River, we have a strong basis to assess whether or not our data reflects the natural variability or anthropogenic input.

Recent technical advances have also allowed for the measurement of $^{234}U/^{238}U$ in ground waters and the ability to trace U inputs into river systems (e.g., Luo et al., 2000; Reynolds et al., 2003; Hogan et al., 2007). ^{234}U is an intermediate daughter from the decay of ^{238}U. ^{234}U decays to ^{230}Th, with a half-life of 245,249 years (Cheng et al., 2000). Crystal sites that contain the ^{234}U atom are weak due to decay recoil damage and thus are susceptible to selective leaching by water, thus uncontaminated ground water, typically, has high ^{234}U over ^{238}U activity ratio. $^{234}U/^{238}U$ ratios are expressed in delta notation ($\delta^{234}U$), which is the permil variation of the measured $^{234}U/^{238}U$ ratio relative to what is called the secular equilibrium ratio, which is equal to the ratio of their half-lives. Ground waters, in general, have high values (Dickerson and Davidson, 1985). In contrast U from mining and ore processing activity has the normal isotope abundance ratio, $\delta^{234}U = 0$. For example in a study done around the Tuba City UMTRA project, it was that found uncontaminated waters to have $\delta^{234}U$ values approaching 1000 or greater, while U in waters from mining activity in the area typically have $\delta^{234}U$ close to zero (Tso, 2000).

The objectives of this study funded by the TRIF WSP program was to explore the potential of using radiogenic isotopes as a tool to evaluate sources of U, Pb, and other metals in the Colorado River. We used this funding to collect water samples in 2007 and perform analysis of these samples. With supplemental funding from the USDA CREES Regional Water Quality Program we are repeating these analysis for samples collected in 2008. With leveraged funding from the Arizona Grain Research and Promotion Council we evaluated the potential for U and Pb to accumulate in agriculture soils of the LCRR. Finally, with additional funding from the Arizona Iceberg Lettuce Research Council and the USDA Specialty Crop Block Grants Program we evaluated potential U exposure from food crops produced in the LCRR. Studies associated with the leveraged funding are ongoing but we summarize what data is available in this report.

Materials and Methods

U, Pb, and other metals in the Colorado River

In 2007 and 2008, water samples were collected in the Colorado River, and tributaries, from Grand Lake, Colorado, to the last diversion near the international border with Mexico. Water samples were analyzed for total element (Ca, Mg, K, Na, Al, Fe, Zn, Mn, Cu, Se, Pb, Cd, As, U) content by inductively couple plasma/ mass spectroscopy (ICP/MS). Isotopic ratios were measured on a Multi Collector Inductively Coupled Mass Spectrometer (MC-ICPMS) or thermal ionization mass spectrometry (TIMS).

Potential U and Pb Loading of Agriculture Soils in the LCRR

Seven different soil pedons initially sampled in 1972 were again sampled incrementally to a depth of 1.5 m in 2007. Soils collected in 1972 and stored in glass jars, and those collected in 2007 were processed for digestion as an estimate of total metal contents and extraction for bioavailable metal content. Data for soils collected at seven sites over 35 years were used to evaluate the effects of fertilization and other management on metal accumulation in soils.

Soils, plant material, and fertilizers were digested using nitric acid and peroxide block digestion. Potentially bioavailable metals (U and Pb) were extracted from soils using DPTA or ammonium acetate. Water samples, soil, plant, and fertilizer digests, and soil extracts were analyzed for total element content by inductively couple plasma mass spectrometry (ICP-MS) and isotopic ratios were collected using MC-ICPMS and TIMS as described above.

Potential U exposure through Food Crops Produced in the LCRR

Vegetable and fruits crops irrigated with Colorado River water were collected throughout the LCRR. Produce samples brought into the laboratory were diced, mixed thoroughly, and after freezing a sub-sample, they were freeze-dried. The samples were ground and stored in vials for digestion. The samples were digested using nitric acid and peroxide and were analyzed for U using ICP/MS as described above.

Exposure estimates are made using the CARES (Cumulative and Aggregate Risk Evaluation System) model which combines the probability distributions of food intakes and residue concentrations, e.g., using Monte Carlo methods (NRC, 1993).
Data from the U.S. Department of Agriculture's (USDA) Continuing Survey of Food Intakes by Individuals (CSFII) from 1994 through 1996 and the 1998 Supplemental Children's Survey data (USDA, 2000) were used to estimate consumption. The model also includes recipe algorithms.

Results and Discussion

U, Pb, and other metals in the Colorado River

Data shows that the U content of the Colorado River increases from <0.05 μg/L at the headwaters near Grand Lake, Colorado, to values greater than 3 μg/L after descending onto the Colorado Plateau (Figure 1). The U content of Colorado River water diverted for municipal use and irrigation in the lower basin ranged from 3 to 5 μg/L. The values for ^{238}U and ^{235}U show similar trends as expected from their known ratios in the environment. Because of budget limitations, we only performed δ^{234}U on a subset of the water samples. Overall the δ^{234}U values are consistent with the normal weathering of U containing geomedia within the watershed and rule against major contamination from U mines (Figure 2). One exception is the Little Colorado, where it is possible the observed δ^{234}U values were reduced by mine waste. This observation is generally consistent with that reported by others using different methodology (Stewart et al., 2005).

The lead isotope ratios show variation along the course of the river and among its tributaries (Figures 3 through 5) reflecting the variation of the geomedia. Overall, the data are generally consistent with the δ^{234}U data and provide additional evidence for minimal contamination from U mine waste. There are, however, two anomalous observations. These ratio data, and the data for the concentrations of other metals (As,Cd, Ni etc.) not shown for the Las Vegas Wash, are consistent with industrial waste. The other seemingly abnormal observation is the Pb isotope ratios associated with the San Juan River. We suspect the anomalous values associated with the San Juan River are associated with the coal energy industries located in the four corners region. However, this hypothesis needs to be verified with follow up sampling.

The $^{87}Sr/^{86}Sr$ data (figures 6 through 7) are consistent with other data collected along the Colorado River and generally rule against major anthropogenic influences over most of the course of the river and its tributaries (Clow et al., 1997; Gross et al., 2001; Spencer and Patchett, 1997). The higher ratios near the head waters are associated with the weathering of continental minerals likely of volcanic origin. The lower ratios in the Colorado Plateau are consistent with the sedimentary geology of that region and reflective of gypsum and carbonaceous materials in the watershed. The data also show the lower values in the Colorado Plateau compared to the Colorado Trough, from Lake Mead to the last diversion, as reported by others. As with the previous discussion with Pb ratios, a comparison of Sr and Pb ratios confirms the anomalous values observed in the San Juan River and the Las Vegas Wash.

In conclusion, although we did not sample on a spatial scale to rule out temporary local contamination, or on a temporal scale to rule out transitory plumes, the isotope data (U, Sr, and Pb) in the main channel of the Colorado River are generally consistent with the normal weathering of U containing geomedia within the watershed and rule against major contamination from U mines. Continued measurements should be made such that a baseline can be made before future mining activity commences or accidental release occurs. Ongoing studies aimed at confirming these results are underway, including studies aimed at evaluating metal accumulation and isotopic ratios in chronosequence cores of river sediments.

Potential U and Pb Loading of Agriculture Soils in the LCRR

The average U contents of irrigation water diverted for agriculture and P fertilizers used in the LCRR are shown in Table 1. From these data we can estimate potential uranium loads to agricultural soils. Using lettuce as an example, the crop receives approximately 40 cm of irrigation water and 600 kg/ha P fertilizer. Hence, from the values reported in Table 1 we estimate potential seasonal U loads to lettuce fields of 16 g/ha from irrigation water and 118g/ha from P fertilizer. However, dissolved U can also leave the soil with drainage water.

Analysis of metals in agriculture pedons indicate statistically significant accumulation of total U in agricultural soils but no significant accumulation in total Pb over the past 35 years (Tables 2 and 3). We could not detect significant increases in bioavailable U or Pb as estimated by DPTA extraction. With funding from other sources we are currently using lysimeters to calculate seasonal mass balance of U and Pb in lettuce production systems.

Phosphorus fertilizer has a unique Pb isotopic ratio (Table 4) as a result of high U content and decay, distinguishing it from the Pb signature of irrigation water and bioavailable soil Pb of the region. These data show very little Pb in lettuce is derived from the fertilizer. By inference, we assume that only a small percentage of the U in lettuce derived from the fertilizer as well. These data suggest that the Pb, and by proxy U, in fertilizers are being incorporated into soil fractions that are not available to crops. We are currently determining the δ^{234}U of the fertilizer and crops to verify our finding with radiogenic Pb but these data were not available as of the writing of this report. Through ongoing studies we are also exploring fractionation schemes to identify the fate of fertilizer derived U and Pb.

In conclusion, both irrigation water and P fertilizers are sources of U to agricultural soils in the lower Colorado River Region. However, we could detect no increase in bioavailable U or Pb after 35 years of irrigation and fertilization.

Potential U exposure through Food Crops Produced in the LCRR

Uranium was found at low levels in most food crops tested (Table 5). Generally, leafy vegetables such as lettuce and spinach had higher concentrations compared to fruiting crops such as citrus, tomatoes, and dates. In fact, for dates the U contents were all below the LOQ and values were estimated as 0.5 the detection limit.

The data show that fruits and juices would be the primary sources of U exposure for children but leafy vegetables would be the primary sources for adults (Table 6). However, regardless of the food source, U exposures were less than 2% the more conservative reference dose established by the WHO for all age and gender groups (Table 7). In summary, the potential U exposures from vegetable and fruit crops produced in the LCRR are negligible relative to health risks.

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Table 1. **Mean uranium and lead contents of irrigation water and P fertilizer used for in the LCRR.**

Source	Uranium	Lead
Irrigation water (ug/L)	4.1	0.13
P Fertilizer (mg/kg)	190	3.3

Table 2. **Uranium content of agricultural soil from pedons in LCRR after 35 years of irrigation and fertilization.**

Metal	Year	0-30 cm depth	0-150 cm depth
Acid Digest			
U (ug/kg)	1972	1126	885
	2007	1315	881
Stat.		0.04	NS
DPTA Extraction			
U (ug/kg)	1972	2.5	3.6
	2007	2.3	3.2
		NS	NS

Table 3. **Lead content of agricultural soil from pedons in LCRR after 35 years of irrigation and fertilization.**

Metal	Year	0-30 cm depth	0-150 cm depth
Acid Digest			
Pb (mg/kg)	1972	17.6	12.6
	2007	18.1	10.5
Stat.		NS	NS
DPTA Extraction			
Pb (mg/kg)	1972	2.0	1.3
	2007	2.4	1.1
		NS	NS

Table 4. **Lead isotopic ratios of potential sources of metals and potential sink (lettuce).**

Source	**^{206}Pb/^{204}Pb**	**^{207}Pb/^{204}Pb**	**^{208}Pb/^{204}Pb**
Irrigation Water	19.044	15.698	38.816
Surface Soil (1972)[1]	18.864	15.635	38.602
Surface Soil (2007)[1]	18.923	15.644	38.622
P Fertilizer	72.658	18.469	38.828
Lettuce	18.739	15.652	38.489

[1] The values for surface soils were obtained after ammonium acetate extraction and would present metals in exchangeable and carbonate fractions.

Table 5. Crops included in the assessment, area of production in lower Colorado River region (LCRR), percentage of total U.S. crop, number of samples collected, and observed uranium concentrations.

Crop	Area of production in LCRR hectares (ha)	LCRR as a percentage of total U.S. crop (%)	n	Uranium (µg/kg fw)	
				Range	Mean
Artichokes (*Cynara scolymus*)	307	14.5	3	0.26-9.57	3.57
Broccoli (*Brassica oleracea italica*)	9516	18.0	20	0.31-1.34	0.65
Cabbage (*Brassica oleracea capitata*)	1042	4.6	20	0.14-0.98	0.34
Carrots (*Daucus carota sativus*)	7227	28.0	19	0.03-3.46	1.47
Cauliflower (*Brassica oleracea botrytis*)	3,519	25.6	20	0.13-1.14	0.37
Celery (*Apium graveolens*)	553	4.3	17	0.18-10.69	1.49
Dates (*Phoenix sylvestris*)	2,925	100	17		0.18
Eggplant (*Solanum melongena*)	141	13.8	3	0.02-0.56	0.20
Grapefruit (*Citrus Paradise*)	1,010	3.1	10	0.1-0.47	0.16
Grape (*Vitis vinifera*)	3,485	7.4	16	0.05-10.48	1.65
Green beans (*Phaseolus vulgaris*)	303	1.3	2	0.14-1.78	0.96
Lemon (*Citrus limon*)	7,085	32.1	26	0.02-0.55	0.10
Lettuce Head (*Lactuca sativa*)	25,669	32.9	48	0.12-7.55	2.75
Lettuce Leaf (*Lactuca sativa*)	21,252	45.8	72	0.23-13.49	3.42
Melon (*Cucumis melo*)	5,887	15.2	20	0.02-1.22	0.39
Onion (*Allium cepa*)	4,033	5.4	17	0.03-2.37	0.79
Orange (*Citrus sinensis*)	2,905	0.5	21	0.03-0.81	0.22
Pepper (*Capsicum annuum*)	1,804	10.6	16	0.02-1.44	0.35
Spinach (*Spinacia oleracea*)	2,951	15.2	30	3.3-44.8	9.8
Squash (*Cucurbita* sp)	79	0.3	4	0.08-0.26	0.17
Sweet corn (*Zea mays*)	3,376	5.4	20	0.05-7.96	0.61
Tomato *(Lycopersicon esculentum*)	137	0.03	11	0.01-0.43	0.09
Watermelon (*Citrullus lanatus*)	1,564	4.7	21	0.02-1.50	0.10

Non-detect concentrations were assigned a value equal to method detection limit/2. n = number of samples

Table 6. **Percentage of uranium dose for selected population subgroups from the top nine sources of dose for the total US population.**

Edible Crop	Total US Population	Children 1-2 Yr	Adults >50 Yr
Lettuce	25.4	7.8	27.9
Spinach	11.8	13.4	13.1
Carrots	8.8	12.7	7.9
Orange Juice	8.0	16.6	5.6
Grape	5.0	15.3	3.2
Snap beans	4.1	9.0	3.5
Celery	3.4	3.2	3.4
Broccoli	2.7	3.3	2.6
Watermelon	1.8	2.8	1.4

Table 7. **Chronic cumulative exposure to U for all food crops produced in the LCRR for selected subpopulations.**

Population Subgroup	U exposure (ug/kg bw-day)
US Total	0.0030
Infants	0.0036
Children 1-2 Yr	0.0048
Children 3-5 Yr	0.0040
Females 13-49	0.0029
All Adults>50 Yr	0.0030

The EPA reference dose (RfD) is 3 ug/kg bw-day and the WHO RfD is 0.6 ug/kg bw-day.

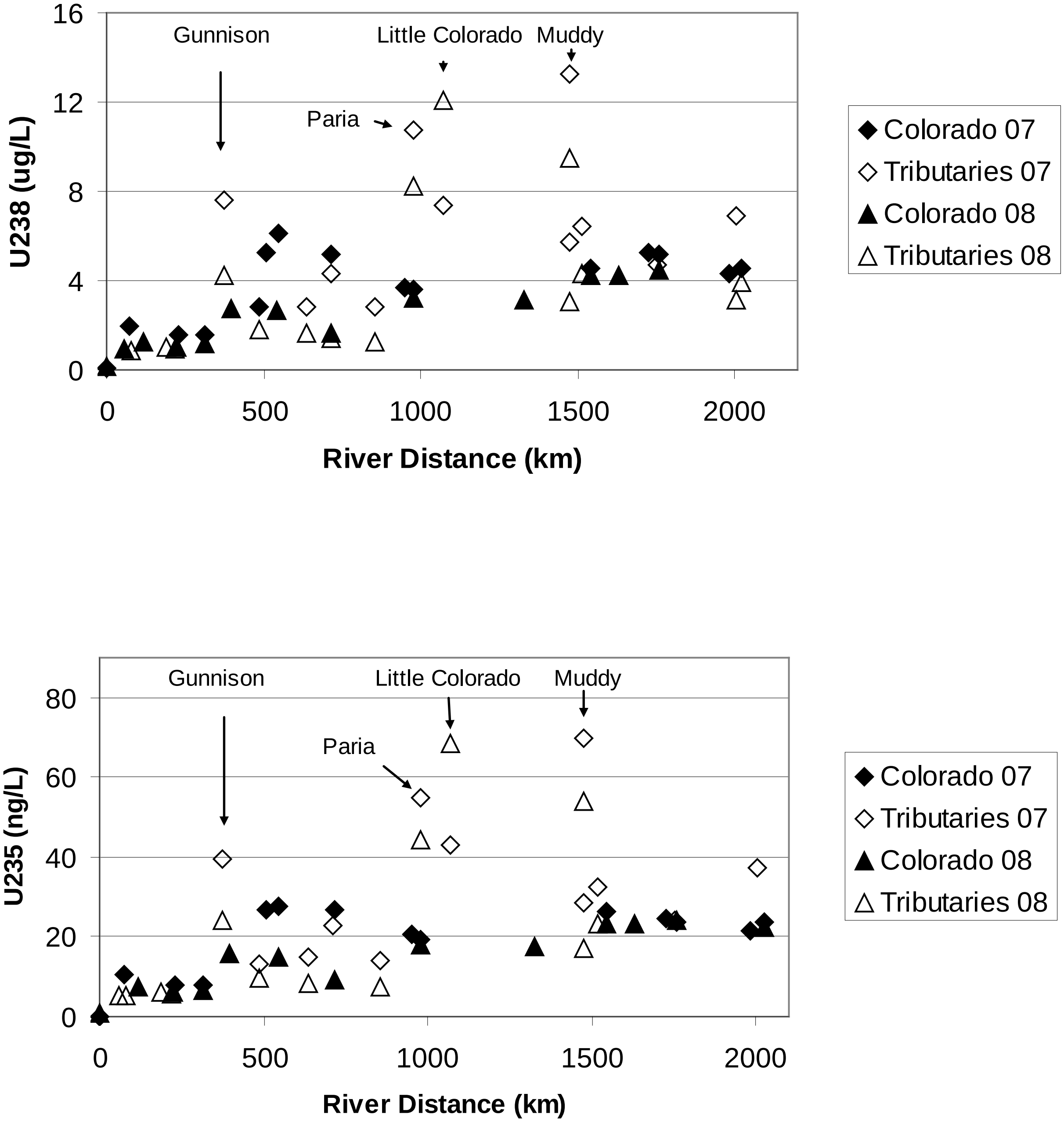

Figure 1. ^{238}U and ^{235}U contents in main channel and tributaries of the Colorado River. The tributaries with the highest U values are identified.

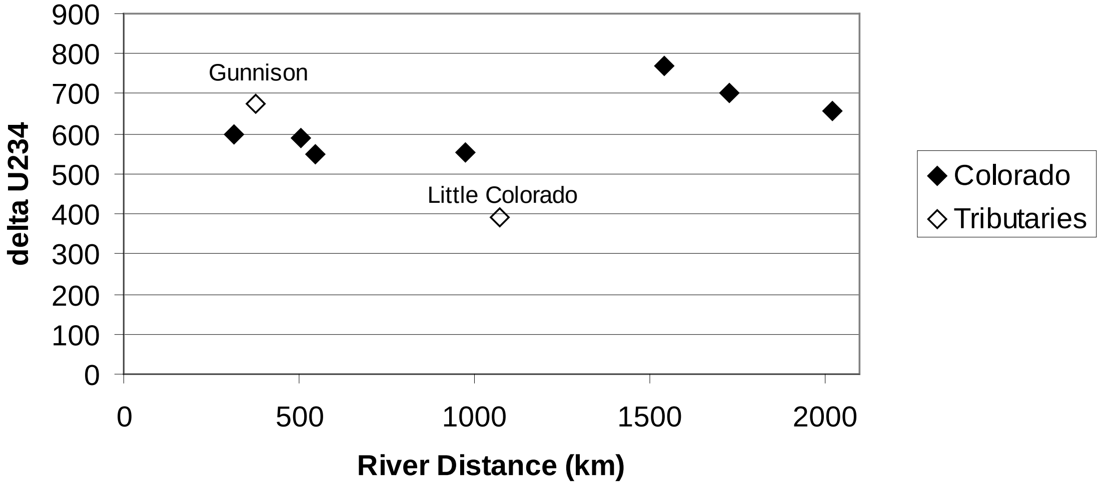

Figure 2. The δ^{234}U values for selected sampling points of main channel of Colorado River and two tributaries with high total U values.

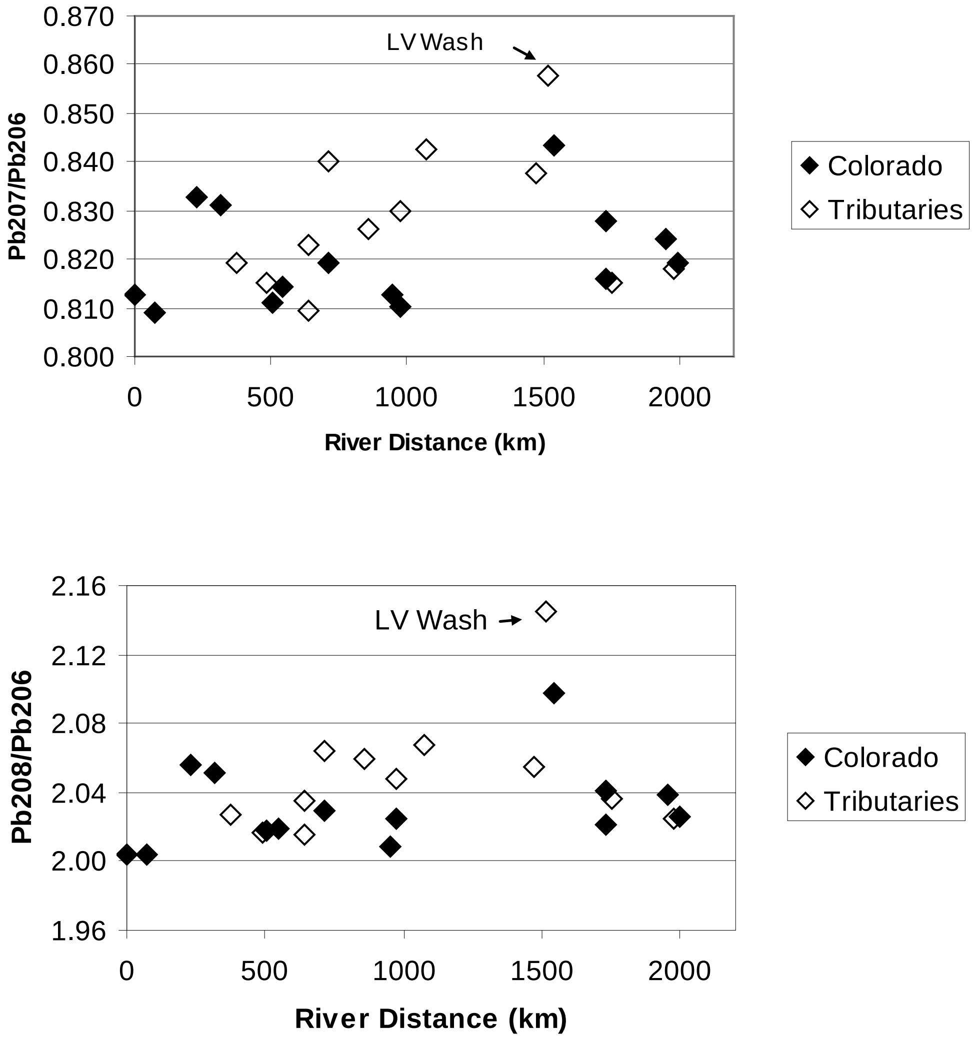

Figure 3. ^{207}Pb/^{206}Pb and ^{208}Pb/^{207}Pb ratios in Colorado River and tributaries.

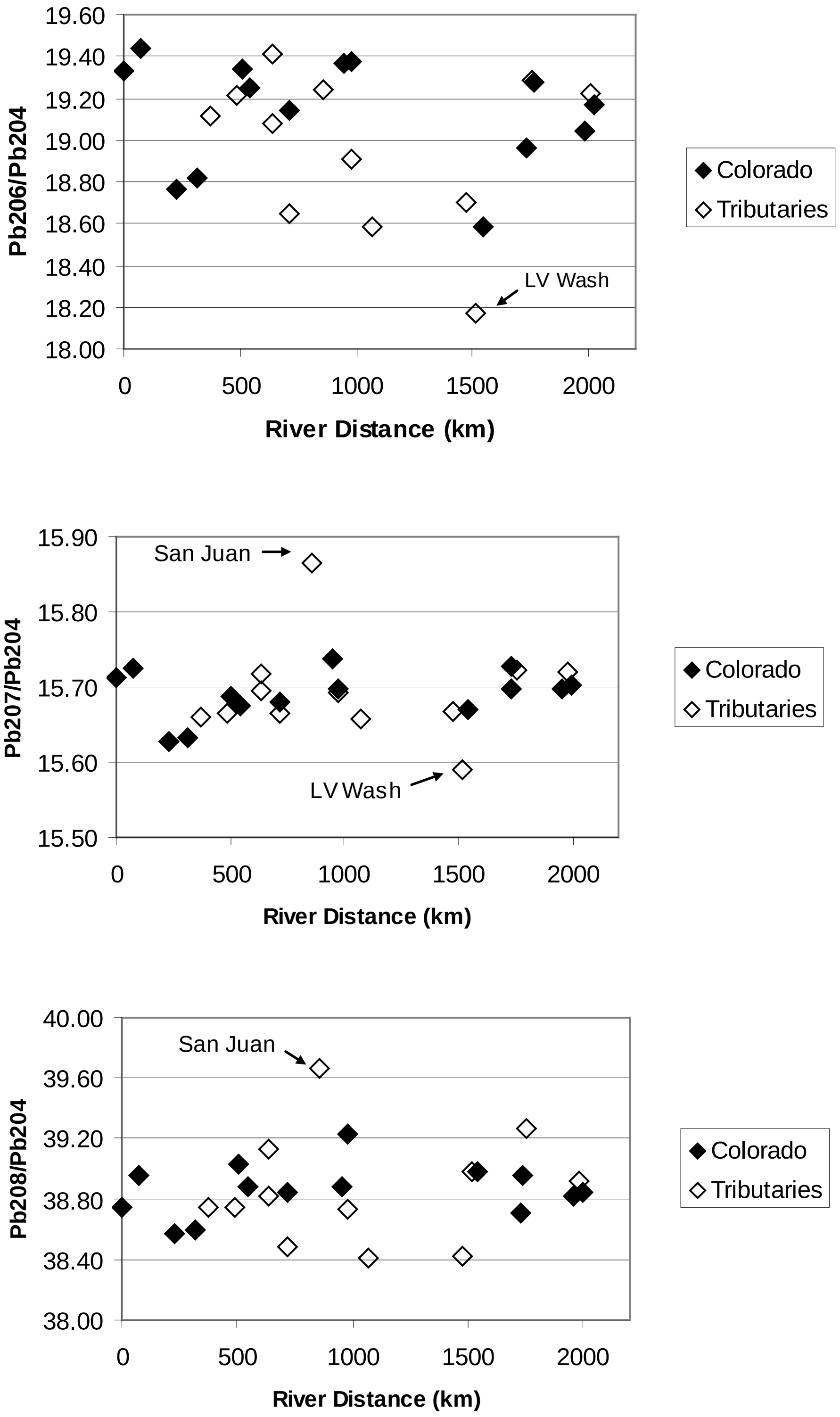

Figure 4. Ratios of radiogenic Pb to Pb^{204} for Colorado River system.

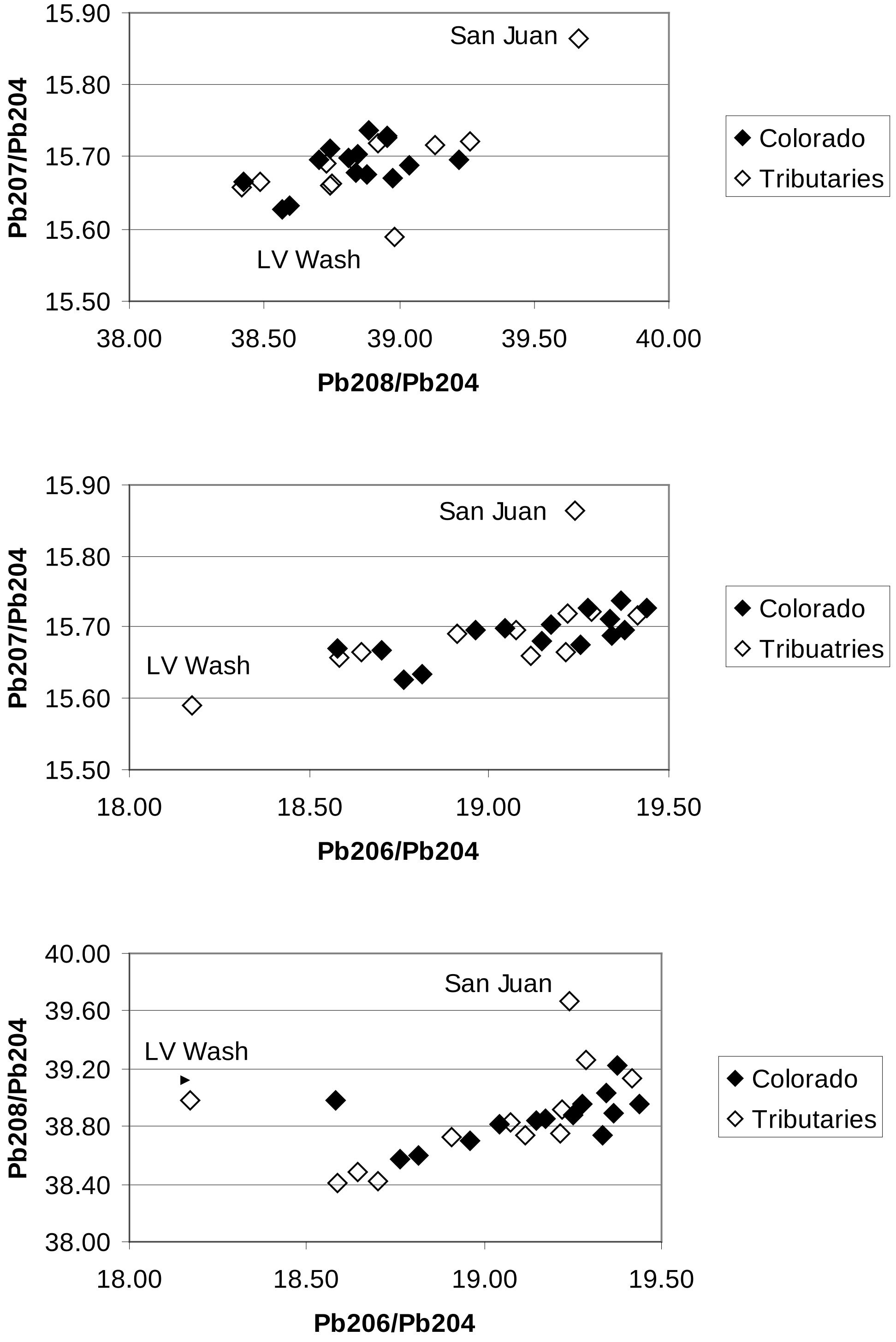

Figure 5. Relationships among Pb isotopic ratios in Colorado River System.

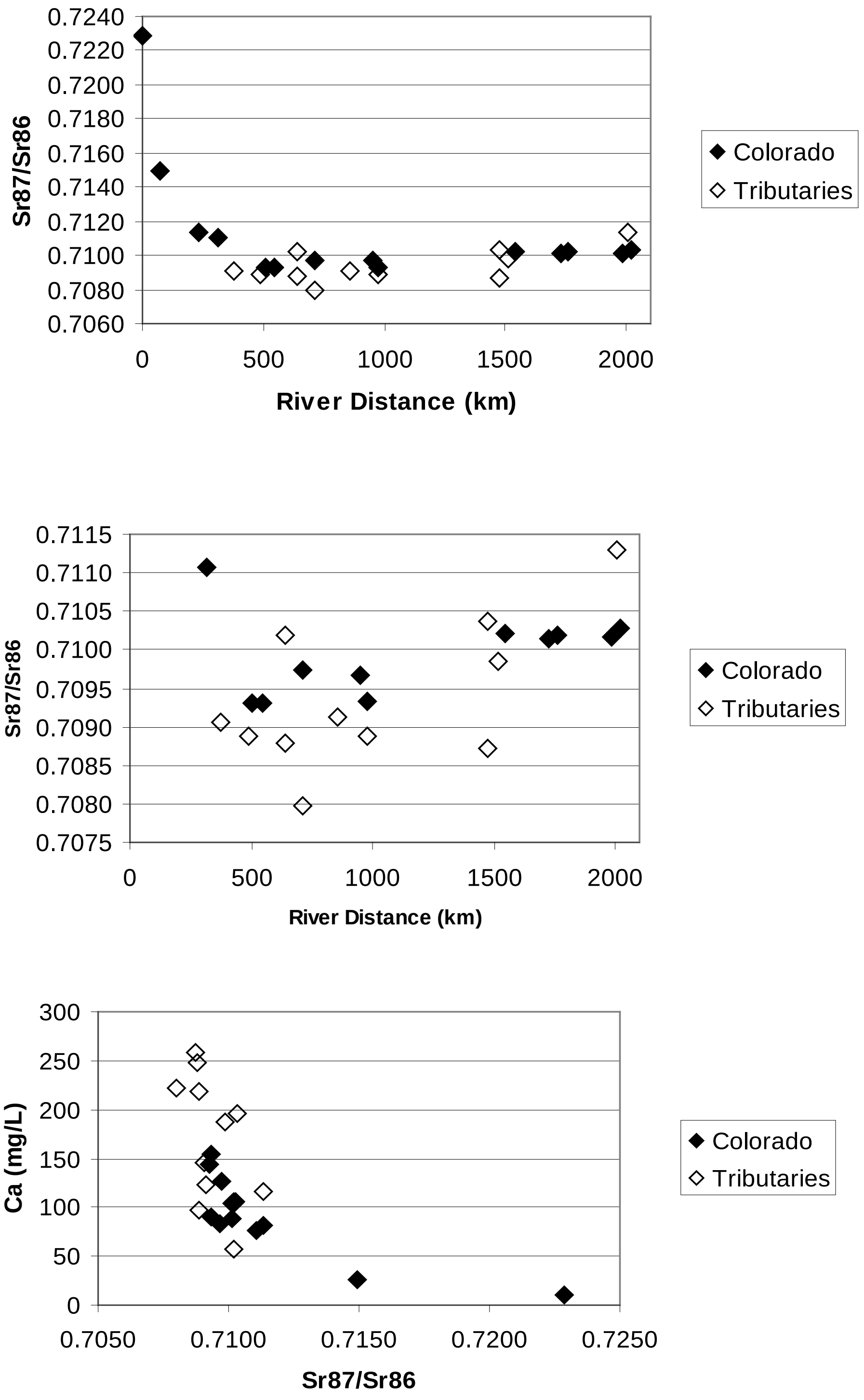

Figure 6. The $^{87}Sr/^{86}Sr$ ratios vs Ca concentrations and river distance in Colorado River system. Figure 6b is an expanded scale for 6a.

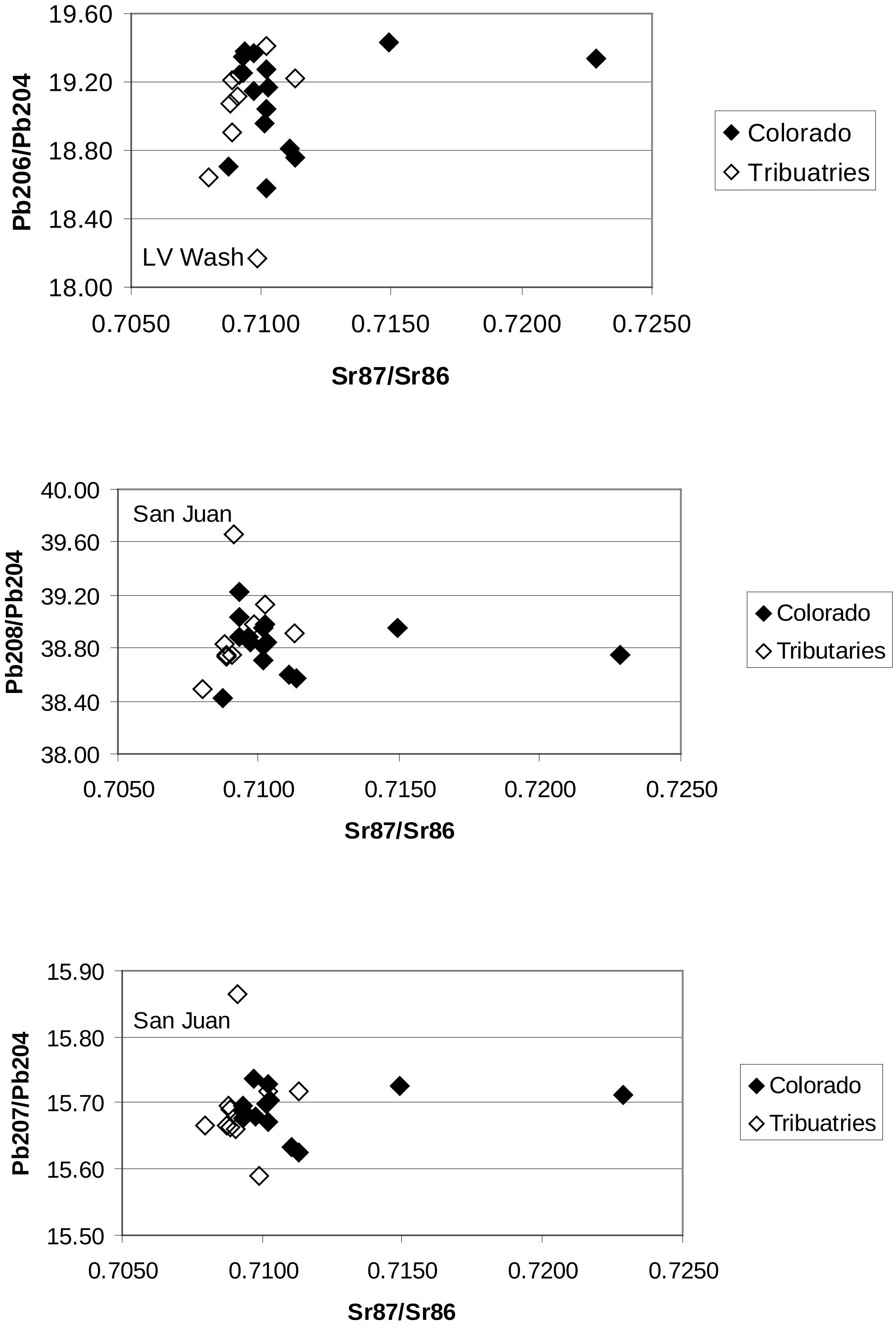

Figure 7. Relationships between Pb isotopes and Sr isotopes in Colorado River system.

WESTERN
BUSINESS
ROUNDTABLE

November 2, 2011

The Honorable Trent Franks
2435 Rayburn House Office Building
Washington, DC 20515

Dear Congressman Franks:

I am writing on behalf of the multi-sector members of the Western Business Roundtable to express our support for "*The Northern Arizona Mining Continuity Act of 2011*" (H.R. 3155). We appreciate your leadership in introducing this important legislation, which would bar the Department of Interior's unilateral withdraw of a huge swath of Western federal lands from access for minerals exploration and production.

In 2009, Secretary of the Interior Ken Salazar proposed the emergency withdrawal from new location and entry under the 1872 Mining Law, of 1,010,776 acres of federal lands in the so-called "Arizona Strip" (Coconino and Mohave Counties, Arizona).

Logically, "emergency withdrawal" implies several things: 1) evidence that environmental degradation is occurring; 2) evidence that the current suite of environmental laws, regulations, agreements, etc. cannot be applied to fix the problems; 3) evidence that the problems are of such scope that emergency withdrawal is the only way to safeguard the resources being impacted.

Here, the misapplication is beyond obvious: not only is there a comprehensive set of environmental laws and regulations in place (Clean Air Act, Clean Water Act, Federal Land Policy and Management Act, National Environmental Policy Act, Endangered Species Act), but there is a good track record of compliance by uranium producers. In fact, the evidence points to the fact that current system of protections – down to and including specific project reviews – is working well.

In fact, even a Draft Environmental Impact Statement ordered by Secretary Salazar confirms that fact. The DEIS considered potential impacts on air emissions, water resources, soil resources, vegetation, fish and wildlife, wilderness resources, and recreation and tourism. Its conclusion: there is "no conclusive evidence" that modern mining in the region is causing any significant environmental degradation.

With this elaborate system of checks and balances in place, it is far from clear what problem the Department is seeking to solve with this huge withdrawal of lands. Barring some abrogation of duties by the federal land managers in question to properly enforce federal environmental compliance requirements, what exactly is the extraordinary emergency that would justify simply shutting off a million acres of land from an otherwise legal activity?

As you well know, the problems caused by this withdrawal are many, and not only for Arizona. It has profound implications for the nation's economic and energy/minerals security. Beyond the federal, state and local economic consequences (which are huge), three facts are worth emphasizing:

- Nuclear power currently accounts for approximately 20 percent of the nation’s electrical production (zero-emissions power, we might add).

- The United States currently imports 90 percent of the uranium necessary to power those plants.

- The U.S. Geological Survey estimates that the Arizona Strip holds 42 percent of the United States’ undiscovered uranium endowment (the equivalent of 13 billion barrels of oil).

This withdrawal of lands is just the latest in a growing string of Administration actions that are virtually guaranteeing our nation’s long-term dependence on foreign (and often hostile) sources of energy and minerals. Such profound policy incoherence is placing our nation’s security and economic success in serious jeopardy.

Thank you for your leadership on behalf of U.S. economic, energy and minerals security, most recently evidenced through introduction of H.R. 3155.

Sincerely,

Holly Propst

Holly Propst
Executive Director / General Counsel
Western Business Roundtable

The Western Business Roundtable is a broad-based coalition of companies doing business in the Western United States. Our membership is comprised of a coalition of corporations and organizations representing a broad cross-section of Western business including, among others: manufacturing; mining; electric power generation, transmission and distribution; energy infrastructure development; energy supply exploration/development and transportation; energy services; and environmental engineering.

We work to defend the interests of the West and support policies that encourage economic growth and opportunity, freedom of enterprise and a sound approach to conservation and environmental stewardship.