

# **Mineral Resources Essential to National Security and the Green Economy Under Siege**

**Written in October 2010 and Updated in June 2011**

The U.S. is on the verge of a crisis of access to minerals critical to the green economy and national defense. These strategic minerals are found in abundance in the San Juan Mountains, particularly in the area surrounding the Upper Animas River. In fact, this area is one of the most heavily mineralized places in the world, rich in minerals such as tungsten, rare earths, indium, molybdenum, antimony, tellurium, cadmium, manganese, bismuth, gold, silver, zinc, lead, and copper.

This area is sometimes referred to as The Alpine Triangle and is defined by the communities of Lake City, Silverton, and Ouray.

The crisis of access is caused by the fact that the western industrialized world, including the U.S., has become heavily dependent on China for a wide array of strategic metals, and China is cutting back its exports. For example in August 2010, China announced they were going to cut back their export of rare earths by 72%. And in September 2010, they blocked their rare earth exports to Japan due to an otherwise unrelated diplomatic dispute.

## **Politicians On Both Sides Of The Aisle Are Worried**

Representatives from the State of Colorado sitting on both sides of the aisle are taking action to avert the crisis. For example

Mark Udall ( D ): Introduced a bill design to restore our country's leadership in the critical minerals and materials industry, which is increasingly important in the manufacture of clean energy and defense technology. (Press release, "Udall Backs Development of Critical Minerals and Materials", February 22, 2011, [http://markudall.senate.gov/?p=press\\_release&id=933](http://markudall.senate.gov/?p=press_release&id=933))

Doug Lamborn ( R ): Wrote an editorial to the Denver Post on June 8, 2011 with the title "The Importance of Domestic Minerals Production", <http://lamborn.house.gov/index.cfm?sectionid=131&parentid=21&sectiontree=21,131&itemid=835>

## **How Did The U.S. Become Dependent On China?**

During the period of 1980 to 2010, the western industrialized world became heavily dependent on a wide range of strategic metals supplied by China. This happened because China priced their exports cheaply until strategic metals production capacity in the U.S. and elsewhere was destroyed.

Rare earth minerals in the U.S. are a perfect example of this: First, China supplied refined rare earths cheaply to the world. Then the Mountain Pass Rare Earth Mine in California shut down in the 1990s, and subsequently China attempted to purchase the Mountain Pass ore body through a takeover of Unocal Corp. in 2005. Now, the world is almost totally dependent upon China for refined rare earth supplies.

### **Why Is The U.S. In Crisis Today?**

Continuing with the rare earth example, China currently supplies about 97% of the world's refined rare earths, and in August 2010, the Country announced it would cut back its rare earth export quotas by 72%. Further, in September 2010, China started to use the leverage their position affords as a political club. Specifically, they blocked shipments of rare earths to Japan in light of a dispute between the two countries over Japan's detention of a Chinese fishing trawler captain.

Now, the western world has to scramble to re-instate rare earth mine capacity to meet western industrial needs, and in the U.S. it takes many years to put a mine into production, regardless of whether it involves reopening an existing mine or opening up a brand new one. In the meantime, the security of the U.S. is at risk.

The same scenario of Chinese cutbacks in their exports of tungsten, antimony, bismuth, indium and other strategic metals is also playing out. Not only are these metals strategic to the United States today, but it is also apparent that new, expanded uses will be developed in the next few years. Just as the crucial strategic importance of the heavy rare earths could not be foretold thirty years ago, the new uses for indium, tungsten, bismuth and other strategic metals cannot be known at this time. It would be foolhardy to close off the one geographic area of the United States where these are so heavily concentrated in mineral deposits.

### **What Do We Know About Historic Production From Area Mines?**

The mines in the Alpine Triangle have a long history of supplying strategic metals to U.S. industry, particularly in times of war. For example, during World War II the base metal and strategic metal production from the area was so important to the war effort that all males from San Juan County were exempted from the military draft. In addition, the strategic metal production from the western San Juan Mountains during World War I, World War II, and the Korean War included tungsten, bismuth, antimony, manganese, cadmium, gold, silver, zinc, lead, and copper.

While no records were kept of the aggregate strategic metals production from the Area, records do exist for the production of select base metals over the last 120 years. The western San Juan Mountains have produced:

8.4 million troy ounces of gold worth \$13 billion.

175 million troy ounces of silver worth \$6.1 billion

654,000 tons of zinc worth \$1.26 billion

905,000 tons of lead worth \$1.72 billion

153,000 tons of copper worth \$1.27 billion

(source: Paul J. Bartos, October, 1993 Society of Economic Geologists Newsletter)

### **What Do We Know About Existing Reserves In The Area?**

The following metals are found in the San Juan Mountains, and their strategic importance is described. This is not a comprehensive list of the strategic metals to be found, but it is a list of some of the primary ones.

**TELLURIUM:** Mr. Tim Gessert of National Renewable Energy Laboratory (NREL) predicts 65% of solar panels manufactured in 2035 will be thin film panels based on tellurium. That means demand for tellurium between 2011 and 2035 will be 676,000 metric tons. Today, the world mining industry produces just 400 to 600 metric tons per year, and China supplies 43% of the U.S. imports of tellurium.

In addition, tellurium has other specialized uses in high tech applications, and it is thought that the unique properties of tellurium will have expanded high tech and green energy applications in the future. The western San Juan Mountain Range is one of the few potential primary sources of tellurium in the U.S. due to the presence of gold tellurides at the Gold King and other mines. Efforts are being made to re-open the Gold King mine for gold and tellurium production at the present time.

**RARE EARTHS:** Rare earths are used in many “green,” high tech and military applications. The western world is just waking up to the fact that they are almost exclusively dependent on China for the rare earths they need for the highest growth areas of their economies and for many military purposes. The fact that China is now implementing a large reduction in its rare earth export quotas has sent alarm bells ringing from Tokyo to Washington to Berlin. The western world has been caught flat-footed in a rare earth supply crunch.

In the western San Juan Mountains, these elements, particularly the heavy rare earth elements, are known to exist throughout local volcanic tuffs and other rocks. Ironically, the incidence of rare earths in this area is known largely through petrological and environmental studies. In addition, high concentrations of rare earths are known to exist in the Fish Canyon Tuff member which covers 5,000 square kilometers. The U.S. Geological Survey has also published work on the rare earth contents of acid springs in San Juan County through its environmental studies ([http://toxics.usgs.gov/pubs/wri99-4018/Volume1/sectionA/1211\\_Verplanck/pdf/1211\\_Verplanck.pdf](http://toxics.usgs.gov/pubs/wri99-4018/Volume1/sectionA/1211_Verplanck/pdf/1211_Verplanck.pdf)), and the author has encountered heavy rare earth mineralization in spectrographic analyses from samples

from his mineral exploration sampling in San Juan County. Many areas of the United States have never been thoroughly explored for rare earth production potential, including the western San Juan Mountains. However, it is critically important that an exploration program for rare earths in the Alpine Triangle precede any official move to make the area a National Conservation Area.

**TUNGSTEN:** Tungsten is used in the production of machine tool parts, wear resistant materials, armor, welding, super alloys and electronics. The U.S. Geological Survey reported that only one tungsten mine in the entire United States operated in 2009. Almost the entirety of U.S. tungsten requirements are imported, with China supplying 43%, and other countries supplying the balance. The U.S. Bureau of Mines produced Information Circular 7731 “Tungsten Potential in the San Juan Area, Ouray, San Juan and San Miguel Counties, Colo.” in 1956. The Bureau of Mines examined fifty tungsten mines in the western San Juan Mountains, documenting ore grades of up to 30%-40% tungsten oxide. Such ore grades are unheard of elsewhere in the world. The tungsten output from this area was of vital importance in World War I and World War II. The author believes that a large disseminated tungsten ore body exists in San Juan County that could supply a large part of U.S. tungsten needs. Parts of this ore body lie on federal lands, and its exploitation would be precluded by the creation of the Alpine Triangle National Conservation Area.

**INDIUM:** Indium is essential to LCD screen technologies and to photovoltaic cell production (copper-gallium-indium-selenide). In fact, without indium, LCD screens and solar cells can not be produced. The U.S. imports 100% of the indium it consumes today, and a large percent of the indium it consumes comes from China. Typical indium grades associated with zinc ores are approximately 15 to 50 parts per million. The U.S. Geological Survey (Professional Paper 535) has documented indium ore grades in San Juan County up to 1% indium (10,000 parts per million, which is the highest indium grade the author has ever heard of in the world). The western San Juan Mountains represent a huge indium resource for the United States, and preserving the ability to mine indium from this area will be critical in the coming decades.

**MOLYBDENUM:** Molybdenum is used in steel and super alloy production. The U.S. is currently fortunate to have substantial molybdenum production; however, no real substitutes exist for this metal. The western San Juan Mountains have three known molybdenum porphyry deposits within the confines of the proposed National Conservation Area. Even larger, higher grade molybdenum porphyry deposits are thought to exist elsewhere in San Juan and Hinsdale Counties. Closing these areas off to future production will be counter to the interests of the United States.

**MANGANESE:** Manganese is used in ferroalloy production and fertilizers. The U.S. does not currently produce manganese ore and is heavily dependent on manganese imports from Africa. The U.S. experienced a “Manganese Crisis” during World War II and the Korean War, and the U.S. Bureau of Mines consequently spent a large sum defining a 25 million ton manganese ore body in San Juan County, together with plans to erect a manganese smelter at Eureka in San Juan County in the 1950s.

**BISMUTH:** The U.S. ceased primary production of bismuth in 1997, and is thus dependent on imports. China supplies about 26% of U.S. imports. Bismuth is used in pharmaceuticals and fire sprinkler systems. The lead and zinc ores of the western San Juan Mountains are known to routinely carry significant levels of bismuth. In fact, The Gold King Mine in San Juan County originally operated as a bismuth mine. Significant bismuth occurs with silver throughout San Juan County. As such, the western San Juan Mountains represent a large part of the bismuth production potential of the United States.

**ANTIMONY:** No antimony was mined in the U.S. in 2009, and China supplies 67% of the needs of the U.S. Antimony is used in battery production, flame retardants, and paints. Antimony occurs throughout the western San Juan Mountains as a constituent of lead and zinc ores and tetrahedrite deposits are known in the area. The western San Juan Mountains produced a significant amount of antimony in World War II.

**CADMIUM:** Cadmium is recovered as a byproduct from zinc ore production. The zinc ores of the San Juan Mountains carry significant cadmium contents, and would serve as a domestic resource if new high tech applications (such as photovoltaics) are found for cadmium.

**GOLD:** Gold is perhaps the most strategic metal of them all, when you consider that gold underpinned the world economic system for millennia. Gold's role as a monetary metal is again becoming very obvious in the fall of 2010, as a currency and trade war is starting. The western San Juan Mountains represents one of America's best means of rapidly increasing gold production by placing older, known mines back into production. The fact that two milling facilities exist to allow rapid processing of newly mined gold ores may be critical to the U.S. in the next several years.

**SILVER:** Both gold and silver are critical to the manufacture of electronics. The ability to mine silver in the San Juan Mountains also produces the byproduct strategic metals listed above. The silver production capacity of the Alpine Triangle will bolster the U.S. monetarily in future years, and increase domestic sources of silver for electronic manufacturing.

## **IN SUMMARY**

It would be a terrible mistake for the U.S. to prohibit mining in the San Juan Mountains of southwest Colorado. Yet, that would be the result of creating a National Conservation Area, a National Monument, or a National Park in the region.

The mineral output of the area met large national emergency needs in World War I, World War II and the Korean War, and the area is still one of the most heavily mineralized places on earth. This mineralization contains large occurrences of relatively rare strategic metals essential to U.S. defense and economic growth. The United States is very vulnerable to China's moves today and tomorrow to restrict metal exports, and it is critical that the resources in the western San Juan Mountains remain available to meet

U.S. domestic needs. If the area is “shut off” by designation as a National Conservation Area and the U.S. enters an armed conflict with China over Taiwan, the South China Sea, or some other reason, the men and women in the U.S. armed forces will pay the ultimate price. The western San Juan Mountains must remain open to mineral production for both national defense and economic growth reasons. Anything less is a betrayal of our Country and its future.