

Canyon Legacy

Journal of the Dan O'Laurie Museum of Moab

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Uranium! - Part 1



Canyon Legacy

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Within...

you'll be caught up with the fascination and excitement of the "Uranium Boom," the single most developmental event in the history of the Moab area. This does not mean that there was not a town before, nor an evolving town later, but the "Boom" required that Moab step forward during a relatively short and intense period of time and rise to an opportunity many towns are never presented with. Various people - Howard Balsley, Charlie Steen, Bill McCormick, Mitch Melich, Dan O'Laurie, and all of the individual prospectors, miners, developers, and even charlatans - drove the forward motion and fervor of the era. They steered it to new heights of enthusiasm even as the government began to slowly and inexorably back away from its commitment to uranium and the local industrial base it had created. Charlie Steen was, after his discovery, literally the Bill Gates of the 50s with his rags-to-riches story turning into everyone's version of the American Dream.

The era of the "Boom" (and the lives of those involved with it) has been dealt with in various ways. In this and our next issue we'll look at it from the viewpoint of both the researcher and the insider. We'll learn about the dreams of men who sought the riches of the earth as well as the realities of the government that regulated the industry at the time. And, as uranium and its new potential becomes a point of contention once again, we'll hopefully look at the past and learn for the future.

- Rusty

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The mission of the Dan O'Laurie Museum of Moab is to preserve and display artifacts and information, and to promote research and education which accurately reflect the natural and cultural history of the Moab area.

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Front Cover: Charlie Steen stands between piles of his ore as it sits in Thompson waiting to be shipped to the mill in Rifle, CO. (Steen collection)

Back Cover: Charlie Steen at his Mi Vida mine, watching his dream come true. (Steen collection)

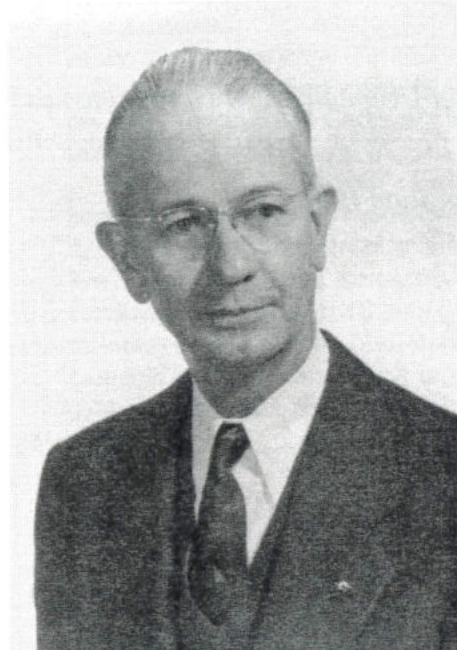
Above: Inside a uranium mine (Steen collection)

Howard W. Balsley, Dean of Uranium Miners and Civic Leader of Moab

by Richard E. Westwood

Howard Warren Balsley, lately of Indianapolis, stepped off the westbound train at Thompson's Springs, Utah, one snowy day in 1908. This studious-looking young man of twenty-two had bought a round-trip ticket from Indianapolis to Salt Lake City. He wanted to visit his sister, Nellie, in Moab before continuing on to Utah's capital city. Nellie and some other Indiana residents had invested in an irrigation project at Valley City, six miles south of Crescent Junction near present-day Highway 191.¹

Thompson's Springs, a station for the Denver and Rio Grande Western Railroad thirty-two miles north of Moab, was the trading post for stockmen who wintered their sheep and cattle on the open ranges of southeastern Utah. While awaiting transportation, young Balsley mingled with cowboys, camp movers, shearers and freighters, the latter coming to the station for merchandise for people living far from the railroad. He found this group to be friendly, though rough. They fit his picture of what westerners would be like. Finally catching a ride with a young man who had taken his wife to the railroad for a trip back to Ohio to visit her family, Howard arrived in Moab



Howard Balsley, photo courtesy of Carol Hines

on his birthday, December 7, 1908.

Howard had always wanted to see Salt Lake City and had bought his ticket to go on that far, so after a few days in Moab he boarded the stage and headed back to the railroad station at Thompson's Springs. Because of the rough conditions on the stage route, the operators used mostly tough outlaw horses on their stages. It took several men to hold them long enough to get them harnessed and started on their way.

It was still not daylight when they reached the Colorado River

northwest of Moab. It had to be crossed by ferry boat. The night had been very cold and when they got to the river they found it frozen over about a third of the way from each bank, with open water flowing in the middle. The ferry boat was frozen in the ice. They all had to pitch in, chop the boat out of the ice, and make a channel to the open water. Then the outlaw horses were herded onto the boat for the start across the river. Two-thirds of the way across the stream they encountered ice again and had to chop their way to the other side. The hostler drove the stage up the steep bank and they were on their way again.

After several enjoyable days touring Salt Lake City, "looking over the many things of unique interest in that most unusual city, with all its romantic past history," the energetic traveler returned to Moab where he soon became interested in the development at Valley City. The promoter was a man he had known back in Indianapolis. The project boasted a large two-story house and several other houses on about forty acres planted in peach trees. The ground was obviously fertile. Impressed, Balsley invested all his savings in the project. He found out later that the treasurer of the project had squandered much of the

money on horse races. The promised concrete dam was never constructed. A flood washed out the dirt dam just when the peach trees were about to produce fruit. The investors' hopes were washed away with the flood. All the Hoosiers except Howard and a man named Mars Pope returned to Indiana.

Howard liked the red rock country and found the people hospitable, so he stayed. The longer he stayed, the better he liked it. He made the town his home for the rest of his long and productive life, becoming a respected civic leader and a living legend in the mining business.

Howard Balsley was born in Connellsville, Fayette County, Pennsylvania, on December 7, 1886. When he was seven, his family moved to an unproductive twenty-acre farm near Seymour, Jackson County, Indiana. After graduating from high school at Seymour he moved with his folks to Indianapolis. There he worked at various factory jobs, earning as much as \$4.50 per week for six eight-hour days. By this means he graduated from business college where he studied shorthand, typing, commercial law, business English, and accounting. Afterward he worked at temporary jobs that gave him varied clerical experience in several lines of business.

Nevertheless, Howard found few employment opportunities in Moab that first winter. During his first three months there he made exactly fifty cents, turning a corn sheller by hand for half a day. He said, "Had it not been for the fact that there were lots of rabbits in the country and I was a pretty good shot, I would

surely have gone hungry many times during those first few months in the West."

In the spring he secured a job with an old bachelor farmer named Jed Bartlett, who had had one eye shot out by Indians. Bartlett, an eccentric old fellow usually well soaked up in homemade wine, was a veteran of the California gold mines. Every day was payday with him, and each evening, without fail, he would hand Howard a silver dollar. Bartlett turned over a spirited team to Howard and started him to work making a deep cut for an irrigation ditch across a piece of ground that was overgrown with willows. When Howard would first get on the job in the morning, the team was so frisky that he could not handle both horses by himself. So he would hitch one of them to the slush scraper and work that animal until some of the friskiness was gone and then work the other one in like manner. Then he would hitch them up together and the work would progress smoothly until, for no apparent reason, they took a notion to run away. Howard would try to slow them down by lifting up the scraper handles to make it dig deeper into the ground. Often the scraper would catch on a willow root, sending him flying through the air. He said, "Fortunately, the dirt wasn't too hard so I suffered no broken bones—but I *did* suffer."

After several months of working for the old man, Howard managed to save \$30. He used it to go to Grand Junction, Colorado, to file an application for a Forest Service job. He passed the Civil Service examination for the position of clerk. The job paid \$75 a month.

Howard married Jessie Trout in 1912. With the added responsibility of a wife, he took another Civil Service examination—this time for the job of forest ranger. By virtue of studious preparation and varied field experience, he passed the examination with the highest grade of anybody in District Four, which comprised several states or parts of states. The job of forest ranger paid \$91.66 per month but required him to have horses to ride and pack and the necessary tack to go with them. He also had to furnish his own horse feed, so he did not net much increase in pay. Even so, he liked the outdoor work better.

In 1914, at the age of twenty-eight, he was elected mayor of Moab. Then he learned that civil servants could not hold public office. Although he never served as mayor, Howard Balsley had, by this time, clearly distinguished himself as a young man with a future.

While working as a forest ranger Howard became interested in mining² and began grubstaking various prospectors. He had been told that in 1879, the Talbot brothers of Paradox, Colorado, just over the Utah state line, had found a fissure vein carrying some odd mineral. They assumed it to be silver and had sent a sample of the ore to the American Smelting and Refining Company at Leadville, Colorado, to be assayed. The company advised them that the material was not silver, but they had no idea what it was. Howard also learned that in October 1898, this same fissure was rediscovered by a man named Tom Dolan. Dolan had sent a sample of the ore to the Smithsonian Institution in Washington, D.C., for analysis.

Word came back that the ore was high-grade uranium.

The so-called fissure vein was located on Roc Creek, just across the La Sal Mountains in Sinbad Valley, Colorado. It turned out to be the famous Rajah mine which eventually produced thousands of tons of high-grade uranium ore. On many occasions while riding in that general area, Howard met strings of as many as fifty burros and pack mules loaded with sacks of ore. Most of it was exported to France.

In 1898, Messrs. Poilot and Voilique, two prominent French scientists, visited southwestern Colorado and southeastern Utah and investigated the uranium deposits known to exist there. The Frenchmen proceeded to build and equip, so far as is known, the world's first uranium concentrating mill. It was located near the Dolores River at Camp Snider, San Miguel County, Colorado.

Madame Marie Sklodowska Curie, noted Polish physicist and chemist who, with her French husband Pierre, did all her

scientific work in France, discovered radium and polonium in uranium ore in 1898. She is credited with having been responsible for the coming of the two Frenchmen and the construction of the uranium concentrating mill. Madame Curie herself visited southwestern Colorado and the concentrating mill in 1899. She gave the name carnotite in honor of A. Carnot, French inspector of mines, to the type of ore from this area that contains uranium, radium, and vanadium.³

Some of the prospectors that Howard grubstaked just ate the food he provided for them and appropriated the other supplies and equipment for their own personal use, making little effort to find ore. Others made an honest effort. Among the latter was a man named Charles Snell who was well known for his honesty and integrity. In the spring of 1915, Snell came to Balsley and stated that he had just had a dream. In the dream he had plainly seen a yellow circle in a block of white McElmo sandstone, the formation in

which true carnotite always occurs. Exposed in that formation were numerous veins of high-grade, uranium-bearing ore. It looked like the Upper Cane Springs Wash area. He said he was sure it was uranium and that he could find it.

Howard never had much faith in dreams but, knowing Snell to be honest and sincere, he bought him everything needed for the prospecting trip. After about ten days, Snell returned and stated that he had actually found the yellow circle in the block of sandstone, just as he had dreamed, and he was sure he had discovered a rich uranium deposit.⁴ He staked five claims in the area in his and Balsley's names. Later, they located more claims in the area. Eventually the Yellow Circle Mine produced over a million dollars worth of ore. Unfortunately for Howard, he sold out his interest for a fraction of that before it was fully developed.

On another occasion Howard grubstaked Charlie when he thought he could find some pay ore in Lisbon Valley in San Juan County. Six weeks went by without hearing from the man. Then Howard received a \$27 check from the San Juan County clerk. He could not imagine what it was for. Eventually the prospector showed up and explained: "Well, I didn't find any ore that I thought worth locating, but I did find a wolf den and there were six wolf pups in it. I killed and skinned them and turned the pelts in to the County Clerk for the bounty of \$9 each which the county and state paid jointly for each wolf hide presented—that made \$54 and the \$27 was your half."

In the spring of 1917, Balsley was assigned the job of surveying and mapping all areas within the La Sal National Forest that were suitable for homesteading. He was to make a written report on each tract, citing the apparent advantages and disadvantages from a prospective homesteader's point of view. A soils expert from Washington accompanied him to test the character of the soil and report on the suitability of the land for farming in each locality. Howard said, "He used an auger to drill a hole and get a core. From the taste of the core he could tell if it was agricultural land."

By the middle of the summer the two men had reached the south side of the Blue Mountains and were due to go into Indian country in Allen Canyon next. This was the home of some "Bronco" Indians who refused to live on any reservation. The rangers didn't relish the idea of entering lands claimed by the fugitive Indians, but that was part of their job. They had proceeded only about half a mile before being confronted by a rifle-pointing, angry Indian who Howard recognized as Old Posey. Knowing the man's murderous reputation, Balsley felt that he "died several times during those fleeting moments" that Posey cursed and threatened him. Nevertheless, through verbal reassurance that the government had the Indians' best interest at heart, he managed to keep the old man from pulling the trigger. Later, by enlisting the help of Ute leader Mancos Jim and through some skillful chuckwagon diplomacy, Howard succeeded in securing enough cooperation

from the Indians to complete the survey.

Balsley served nine adventurous years in the Forest Service, rising to the position of ranger-clerk at the salary of \$113.66 per month. Then he decided to try something else. Attracted to public service, he applied for and was appointed to fill the unexpired term of Grand County clerk and auditor and clerk of the Seventh Judicial District Court. He continued in those jobs for thirteen years, being repeatedly reelected, generally without opposition. He wrote, "The residents of Grand County are about evenly divided as between Mormons and Gentiles, but all of them backed me wonderfully." He resigned in the middle of his last elective term in order to devote all of his time to mining and buying uranium-vanadium ores and shipping them to Pittsburgh.

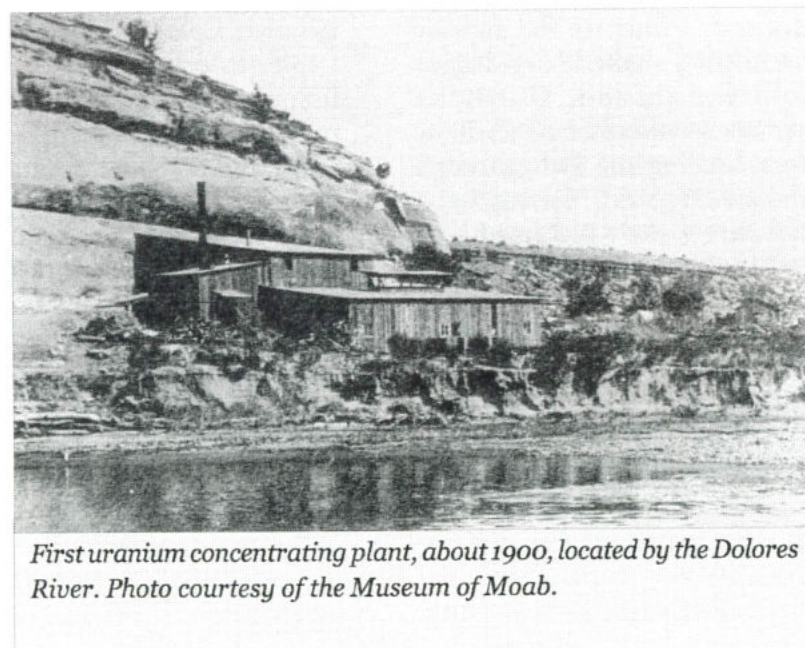
In the spring of 1934, Balsley entered into a contract with the Vitro Manufacturing Company of Pittsburgh in which he agreed to supply their requirements for uranium ore. The contract specified that he deliver ore running a minimum of 1.5 percent uranium oxide and a minimum of 5 percent vanadium oxide. He then arranged for warehouses or other storage facilities in Blanding, Monticello, Moab, Cisco, Thompson, and Green River in Utah and in Grand Junction, Newcastle, Meeker, Montrose, Naturita, Dove Creek, and Egnar in Colorado. His contract called for shipment in fifty-ton carload lots, so he had to accumulate enough ore to make up that quantity. He bought ore from more than 300 small producers scattered across the Colorado Plateau. He bought ore in any

size lots - from twenty-five pounds to a carload - and every lot had to be sacked in 100-pound bags. Then he had to blend the various lots going into a carload so that the required minimum grades could be maintained.

Small producers and their families had to eat while awaiting accurate assays of their ores from Pittsburgh. Using an electroscope to estimate the percentage of uranium in the ore, Balsley would advance money to these miners. He could only guess at the vanadium content of the ore. Years later he recalled that he "took a considerable loss on that account."

Vitro used the ore to supply pottery and glass factories with ceramic colors made from the mineral pigments. The company made twenty-six different shades of red, green, brown, and yellow from the uranium ore. They also used some vanadium in their ceramic colors. Vitro also extracted vanadium from the ore and sold it to steel mills in the form of vanadic acid.

During the eleven years Balsley was affiliated with Vitro he was the only ore buyer on the Colorado Plateau who paid for both uranium and vanadium in the same ore. He obtained most of the ore from small producers. During that time the United States Vanadium Corporation, a wholly owned subsidiary of Union Carbide & Carbon Corporation, was operating vanadium extraction mills at both Uravan and Rifle, Colorado, and the Vanadium Corporation of America had a mill at Naturita, Colorado. Both paid only for the ore's vanadium content.



First uranium concentrating plant, about 1900, located by the Dolores River. Photo courtesy of the Museum of Moab.

During his years in the uranium-vanadium ore business, Howard rode the market up and down a number of times. In the early 1900s, the only use for the ore was its radium content. Miners of the area had developed what they considered a good market for uranium ore when a rich strike of pitchblende was discovered in the Belgian Congo, and they were out of business overnight. Eventually the value of vanadium as a strengthening alloy for steel was discovered. Suddenly the miners had a market for their vanadium, but they received nothing for the uranium content of the ore. They were beginning to prosper again when, in the early 1920s, a mountain of vanadium ore was discovered in South America that could be delivered to the East Coast cheaper than from the Colorado Plateau. With that, the local miners were again out of business.

Thereafter, the market was spotty until early in 1942. In May of that year the government set up a corporation, designated as the Metals Reserve Company, to procure vanadium in a hurry. Buying stations were set up in a number of locations in the carnotite-producing area of southeastern Utah and western Colorado. For a time Howard Balsley was in charge of the station in Moab, located just south of the old cemetery. He and others were authorized to accept all the vanadium ore they could get that ran 1.25 percent or better in vanadium oxide. The ore from the Moab buying station was trucked 160 miles to a U.S. Vanadium mill at Durango, Colorado.

All went well until early 1944 when the government realized that it was overstocked on

vanadium. It issued orders to cease buying at midnight on February 28, and the mines shut down again.

In late 1944 and early 1945, the Manhattan District centered at Los Alamos, New Mexico, was busy perfecting the atomic bomb. The government needed uranium badly. After the bombs were dropped on Japan in 1945, the Manhattan District evolved into the Atomic Energy Commission with headquarters in Washington, D.C. In 1945 the commission commandeered all of the uranium in the nation and took over all plants at which uranium for any purpose was being used.

As late as January 1947, no program had been established by the newly created Atomic Energy Commission for handling the uranium-bearing ores of the West. After considerable correspondence and many long-distance calls, Howard Balsley and Fendoll A. Sitton, a prominent citizen and ore producer of Dove Creek, Colorado, arranged to meet with the Atomic Energy Commission in Washington at noon on February 14. The commission members proved to have little knowledge of uranium. The only satisfaction Balsley and Sitton received was the promise of a full investigation, in due time, of the uranium possibilities in southwestern Colorado and southeastern Utah.

Later in 1947, Balsley made another trip to Washington, this time in the company of Ray A. Bennett of Denver. They were told by a man in charge of the Geological Division of the Atomic Energy Commission, "There just isn't enough uranium in the West to be of any interest. We can get all of the

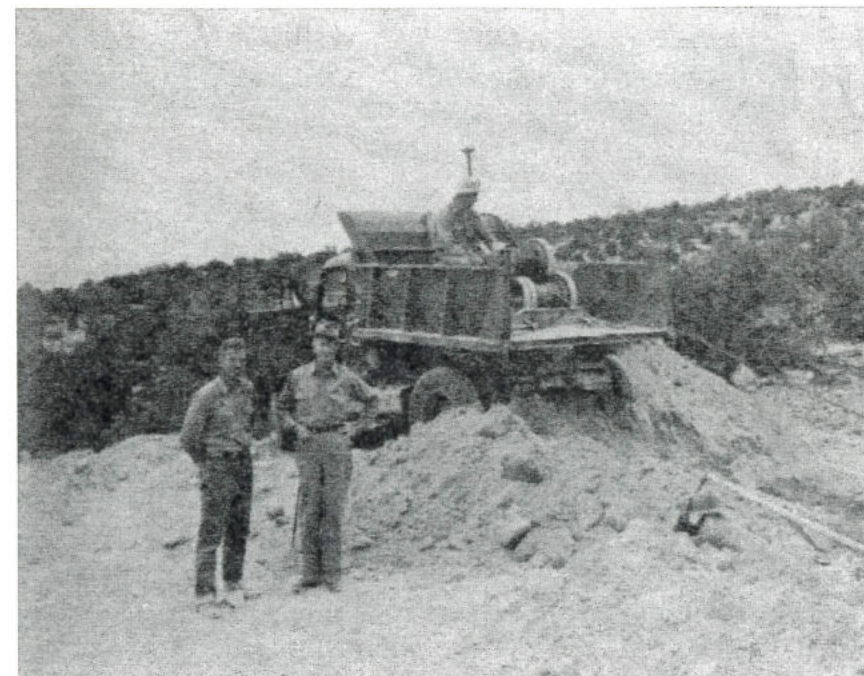
uranium we want from Canada and South Africa."

Balsley and his associates never gave up in the fight for recognition of the West as a potential producer of uranium. In a letter dated February 7, 1948, nearly a year after his first trip to Washington, he received a modicum of encouragement from Sen. Edwin C. Johnson of Colorado:

*Dear Balsley:
Thanks for your good letter. Senator Milikin and I have had a long, hard fight for recognition of our uranium producing possibilities. During the past two weeks we are beginning to see our efforts bear fruit. You may be certain it makes us feel good and you may depend on us to keep plugging.*

Finally the Atomic Energy Commission initiated a thorough exploration program in that section of the country, resulting in an unbelievable amount of uranium ore being discovered. This led to the historical uranium boom of the 1950s about which much has been written. During that time, would-be miners from all over the country descended on Moab. Most found their way to Balsley's door. They would ask him what uranium ore looked like and where to look for it. Howard answered their questions honestly. He certainly knew where to look for it, as he had an interest in mining claims all over that part of the country.

For many years, Howard Balsley kept about a ton and a half of beautiful canary yellow high-grade uranium ore in his warehouse. He said it was just too pretty and rare to sell to the mills, so he kept it for sen-



Howard Balsley at the Yellow Circle mine.

timental reasons. Emanations from uranium-bearing ore can be picked up from the air with the use of a good Geiger counter or scintillator. On several occasions during the uranium boom, planes would circle around his place, picking up those emanations. Then the flying prospectors would come to inform him that they had discovered a high-grade uranium mine in his back yard. He would tell them, "Yes, I know, it is right over there in my storehouse."

Howard Balsley did not confine his activities to mining. He gave much of his time to the community. He served continuously for forty years as a member of the Grand County Board of Education. He helped found the Grand County Library and served as a member of the Library Board and as secretary for many years. He helped found the Grand County Hospital and was one of the original members of the County Welfare Board. He

was chief benefactor of the Community Baptist Church for more than seventy years; the Fellowship Hall in the educational section of the new Community Baptist Church built during the uranium boom was named Balsley Hall in his honor. He was a charter member of the Moab Lions Club and remained active for fifty-two years. He was a Mason, joining the Green River Lodge in 1920 and later becoming a charter member of the Moab Lodge.

Howard was a kindly man, never forgetting the humble circumstances of his youth. He sometimes took pity on some of the poor kids who gathered near the theater in Moab, listening to the sounds of the show inside, and bought them tickets to the movie. Many children in Moab had never seen a train. Howard would periodically load some of them in his car and take them to Thompson to see the trains.

Howard was a respected leader in the mining community.

He instituted a class-action antitrust suit against Vanadium Corporation of America and United States Vanadium Corporation. These companies had for many years underpaid miners for vanadium ore and paid them nothing for the uranium content of the ore while selling the uranium to the government. The suit covered the sales of ore between October 10, 1938, and March 31, 1948. After years of litigation the case was settled in favor of the plaintiffs.⁵ On June 20, 1962, the court set aside \$900,000 for settlement of the claims. By 1965, more than 300 miners or their heirs had shared in the settlement. Balsley had spent thousands of hours in testimony and work on this case. He also wrote and answered hundreds of letters, almost entirely at his own expense, helping to locate miners and their heirs who were due to share in the settlement.

Howard Balsley was a member of the American Institute of Mining Engineers and was recommended for a lifetime membership by the local chapter. In 1974 he was named Man of the Year by the Colorado Mining Association at its 77th Annual Meeting in Denver, an award rarely presented to non-Colorado people.

Years later, Howard's daughter reflected on the many ways uranium touched the lives of people in southeastern Utah:

Mother would make some of these uranium pads - about a foot long - of ground up high-grade uranium sewn inside tanned deer skin - to put on people's ailments, on their stomach or shoulder - wherever they were ailing, infection to arthritis. Everybody around here

used to have a piece of uranium in a jar of water, and drink that water to cure their ailments.

When asked if there had been a high incidence of cancer in the area, she said, "I don't know. A lot of those people lived a longtime. But back then some people died of unknown causes." Howard Balsley died on April 11, 1982, following a short illness, at the age of 95. His daughter overheard someone remark, "That old uranium finally got him."



Slushing operation at the Yellow Circle Mine.

This article is a reprint, with permission, from the *Utah Historical Quarterly*, Fall 1991, Vol 59, No. 4

Richard Westwood has written many articles and books about his local heritage. These include *Chompin' at the Bit* about growing up in Moab as a young boy, *Neil Westwood: A Biography* which relates his father's history, *Woman of the River: Georgie White Clark, White-Water Pioneer*, as well as *Rough Water Man*, the book about his uncle Elwyn Blake's adventures with the USGS surveys.



My Old Man: The Uranium King

by Mark Steen

This article is reprinted, with permission, from a series that Mark Steen wrote for the *Canyon Contry Zephyr*

My father, Charlie Steen, has always maintained that the truth about his discovery of the Mi Vida mine and its consequences is a much better story than the fiction and half-truths that people insist on perpetuating. Despite the fact that his uranium discovery is one of the most publicized and well documented mineral discoveries in history, people can't seem to resist the impulse to distort and rewrite history.

Unfortunately, this isn't confined to bar-room reminiscences and tales told by old miners in rest homes. Articles about other people's roles in my father's discovery and observations by individuals who never met any of the players involved in the events of fifty years ago are now finding their way into print in historical publications. These accounts range from hard-luck stories about people who staked the Mi Vida ore body before my father, but couldn't raise the money to drill where they knew a fortune was awaiting them, to lies about grubstakers being cheated out of millions because they couldn't prove they had financed Charlie Steen's prospecting activities.

Perhaps the most absurd of all of these revisionist discovery stories is the one that has my father's jeep-mounted drill

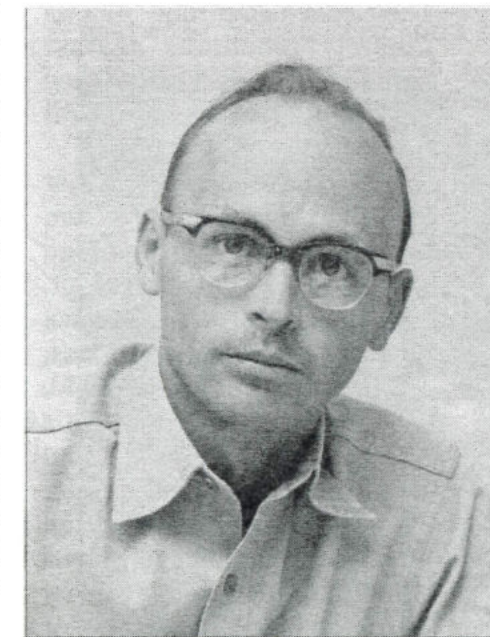
breaking down two or three miles from his intended destination; and, since he couldn't go any further, he supposedly decided to drill for uranium where his rig had come to a halt. In this patently false version, Utah's premier uranium mining area owes its discovery more to mechanical failure than to human endeavor.

Although the Mi Vida uranium mine is recognized by mining historians and members of the mineral exploration business as one of the most important ore deposits found

during the last century, most of the new residents of the area that felt the full impact of the Uranium Boom probably were not around when the rags-to-riches saga of Charlie Steen's successful search for a fortune in uranium touched off one of the greatest rushes in mining history. No town on the Colorado Plateau was more changed by one man's mine than Moab, Utah. Nothing has ever been the same as it was before Charlie Steen drilled into the Mi Vida uranium ore deposit and unlocked the location of over one-billion dollars' worth of one of the most sought-after minerals in history.

Are the facts about Charlie Steen's discovery of the Mi Vida mine actually better than the fiction? After fifty years does anybody care to sort out the truth from the legend? Now that Moab is dependent on tourism and mountain bikers for its seasonal injection of economic life-sustaining lucre, does anyone want to remember the decade of 1950s when Moab was the "Uranium Capital of the World?" Can Moabites today even imagine that people were once drawn to the Canyonlands Country in order to make money mining radioactive mineral deposits?

After all of these years, should more credit or blame be



Charles A. Steen, the "Uranium King"
All photos from the Steen family collection.

assessed against the man whose single-minded determination caused all those tons of tailings to be placed at the entrance of a town that now wants to be rid of them? Are the tailings just an unsightly reminder of its history when Moab relied on mining rather than its scenery? Do people really care anymore about how my father found fame and fortune and earned his rightful place in history, or would they prefer to believe the last thing they read or heard from someone who wishes it had happened differently?

To me, it matters. Here's the way I remember it.

The Early Days

My father's journey to the fortune that he found beneath the Mi Vida claim group in San Juan County, Utah started in Texas, where he grew up amid the wildcatters who transformed the state.

Charlie Steen was born in 1919. His father was an oil prospector who made and lost a small fortune during the few years that he was married to my grandmother, Rosalie. According to my Dad, the only two things he got from his father were his name, Charles Augustus Steen, and a Dalmatian dog. My father and his sister, Maxine, were raised by a succession of stepfathers during the years when the Great Depression dampened the financial excitement of the oil booms, but he never forgot the years when prospecting paid the way.

Growing up dirt-poor toughened my father and strengthened his independence. Determined to succeed, he worked his way through both high school and college with a

series of odd jobs. During the summer months, he worked for the Chicago Bridge and Iron Company in Houston. After attending Tarleton College in Stephenville, Texas where he met my mother, Minnie Lee Holland (who preferred to go by her initials, M.L.), he transferred to the Texas College of Mines and Metallurgy in El Paso and received his degree in geology in 1943.

Poor eyesight and a slight frame prevented him from serving in the war, and he spent the next three years working for a major oil company as a petroleum geologist looking for possible oil structures in the jungle headwaters of the Amazon Basin in Peru.

After returning to this country, he married my mother and worked as a field geologist for the Stanolind Oil Company, until he was fired for insubordination after he argued with two of his bosses over the way they were directing his work. Their conclusion that "he was innately rebellious against authority" got him blackballed by the tightly managed oil companies.

It was the best thing that could have happened to him, because it freed him to go prospecting on his own account. My mother, who had also grown up poor in Sweetwater, Texas, but in a very strict household, was eager to share in his prospecting adventures. Dad spent two years trying to raise enough money to drill some oil and gas properties he believed in, but he needed at least \$100,000 in order to wildcat for oil. He supported his growing family as a small-scale building contractor in Houston, remodeling kitchens, adding

bedrooms and baths—saving money for a grubstake while he tried to interest people in backing his oil play.

Uranium and Lure of Prospecting

Since he couldn't raise the money to go wildcatting for oil, he cast about for some mineral that was in demand and that a man on a mighty slim shoestring might prospect for with a hope of big returns. He read an article in the *"Engineering & Mining Journal"* about the still-young uranium mining industry that was centered on the Four Corners area of the Colorado Plateau, and my father began to read everything he could find about the rare element. Uranium had literally burst upon the world with the detonation of three atomic bombs at the end of World War II.

Prior to the development of the atomic bomb, uranium was considered a pretty worthless element, with few uses aside from being a costly source of radium. The discovery of high-grade pitchblende, one of the primary uranium ore minerals, in the Belgian Congo in the 1920s, made the lower-grade, yellow carnotite uranium ore minerals of the Colorado Plateau uneconomic. Because these ores also contained vanadium, which is used to harden steel, there were several periods when the need for vanadium revived the region's small-scale mining industry. Uranium that was separated from the vanadium and discarded during the milling process was later used to make the first atomic bombs. With the advent of the atomic age and the subsequent arms race with the

Soviet Union, the United States was forced to buy ninety percent of its radioactive materials from the Belgian Congo and Canada.

The country's need for uranium for national defense was so urgent that the government decided it had to stimulate domestic prospecting and production through an incentive program of guaranteed prices, discovery bonuses and development loans. The Atomic Energy Act of 1946 created the Atomic Energy Commission (the AEC), and the government initiated an extensive exploration program to find domestic sources of uranium. The AEC encouraged individuals and companies to increase production by more than doubling the price per pound for high-grade uranium ore to \$31 and with a \$10,000 bonus for the first man to produce 20 tons of ore assaying at least 20% uranium in the United States.

Hundreds of government geologists and mining engineers scoured the Western States, searching for enough uranium ore to feed the two uranium processing plants that were being operated under strict security and behind highly guarded enclosures. While this resulted in an increase in uranium production, almost all of the mines on the Colorado Plateau were located in the Morrison Formation and were relatively small-sized, shallow, and low-grade.

In decades of searching on the Plateau, prospectors had uncovered only three ore deposits amounting to as much as 100,000 tons of this much lower-grade ore, and there were scores of small mines that had been worked out and abandoned. Since few of these smaller

ore deposits held more than 10,000 tons of ore rich enough to be mined at a profit, the outlook for a large-scale uranium industry seemed pretty bleak. These geologic and economic conditions discouraged most of the larger, well-established mining companies from even looking for uranium deposits. And, while there were dozens of local prospectors and miners in southwestern Colorado and southeastern Utah who were making a living off these smaller mines, nobody was making a fortune and no one had discovered a major ore body. Most of these prospectors were part-time uranium seekers who had gained their practical knowledge working in these small mines, or cowboys and sheepherders who were just about the only people who had penetrated one of the most desolate, unsurveyed areas left in the country.

Even though you could stake a mining claim on public land with five claim posts and a

dollar, it cost real money to prospect and explore for ore. My grandmother, Rosalie Shumaker, mortgaged her home in Houston and contributed a thousand dollars to buy a small portable drill. My mother's sister, Tera, talked her husband into loaning my father enough money for a second-hand jeep. By the time that my father set off on his quest for uranium in the summer of 1950, my parents were already raising my three older brothers, and I was on the way. Dad drove the jeep and a 20-foot trailer to Dove Creek, Colorado, and a few weeks after I was born, my mother and brothers and I traveled with my grandmother to join my father while he searched for the uranium that would change all of our lives.

A Grubstake, a Dream, and a Theory

Charlie Steen began his search by studying the geology of the uranium deposits of the area. He couldn't afford to buy a



The Steen family's camp at Yellow Cat. Note the red Jeep Charlie used for so much of his prospecting. Andy and Charles Jr. are out playing while Mark looks through the window of the trailer.



The Steen family packed up everything they owned for their move from Tucson back to Utah.

Geiger counter, but Dad figured that unless he used his education and training as a geologist, he had no better chance than the other prospectors who spent their time walking the rim rocks looking for uranium outcroppings on the surface. Because most of the readily-accessible uranium deposits that outcropped were already staked by the time Dad arrived on the scene, he began to look for the geologic conditions that would cause uranium to collect and concentrate in certain favorable locations where it could be discovered with a drilling rig.

During the time we lived near Dove Creek, my father became friends with Bob Barrett, a slightly prosperous pinto bean farmer who had a pretty strong case of uranium fever. He also became well acquainted with William R. McCormick, the owner of the Dove Creek Mercantile Store. Bill McCormick's honest, generous nature was combined with a very shrewd business sense, but he had a weakness for uranium prospectors and a fondness for the mining game.

The Steens lived on rice, beans, oatmeal, rabbit stew and venison from the deer that my

father shot regardless of the season while he prospected and examined other people's properties for McCormick and Barrett.

On Christmas Day, we moved to the Yellow Cat Wash area south of Cisco, where Dad staked some claims and drilled out a small uranium deposit on the promise of an interest in anything he found from a mining engineer who later reneged on his agreement. Somehow my parents managed to get by with small advances from my grandmother and loans from relatives that didn't average \$60 a month.

Early in 1951, Bill McCormick introduced Dad to Dan Hayes and Donald Adams, two local prospectors and mine owners who had been involved in uranium mining for many years. Hayes and Adams owned the 14 Big Buck claims that had been staked in 1948 to cover a meager exposure of oxidized uranium in the Cutler Formation. Their claims were located on the southwestern flank of the faulted Lisbon Valley anticline in the Big Indian mining district of San Juan County, Utah. The Morrison Formation had been eroded off this upthrown portion of the anticline, and there were

only three small uranium mines located in the entire district. These mines had produced a little more than 2,000 tons of low-grade uranium ore from host rocks in the Cutler Formation. The nearest producing uranium mine was more than twenty miles away from the Big Buck claim group.

All of the AEC and company geologists who had examined the area had written off the Big Indian mining district as an important potential source of uranium by the time Charles Augustus Steen was attracted to the area. There were simply too many better places to explore for uranium on the Colorado Plateau than a mining district that was missing the most important host rocks (the Morrison Formation) to waste much time or any money on the Big Indian mining district.

After examining the geology of the uranium-bearing formation that Hayes and Adams had exposed with four short mine adits and bulldozer cuts along the rim, my father hiked above the Big Buck mine and began his geologic reconnaissance. As he walked and climbed over the rock formations, he began to formulate a theory that the lower grade exposures of uranium in the Cutler Formation would be enriched or concentrated down dip from the outcrops along the escarpment overlooking Big Indian Wash. The terrain was very rugged and without a single road into the country behind the Big Buck claims.

Dad noticed that the crest of the Lisbon Valley anticline was situated just about the same spot where he had hiked in above the rim, and he figured that any uranium that was concentrated

down dip would be found in thicker deposits on this part of the anticlinal structure. He also saw that a large section of the upper rock formations had been removed by erosion, and knew that he would not have to drill through more than three hundred feet of the Wingate sandstone in order to prove his geologic theory.

After spending less than a day examining the rock formations and considering the geology of the area, Dad decided to stake the ground back of the Big Buck claims. Because of the rough nature of the ground and the fact that there were areas with hundreds of feet of air between the places where my father was marking the boundaries of his claims it was very slow going. Working alone, using his Brunton compass and pacing off the 600 by 1500 foot claims, Dad didn't encounter any signs that the ground had ever been staked by anyone else.

After this ground became some of the most valuable land in the county, there were several extensive title searches completed for legal reasons, and they didn't disclose any prior locations. At the end of several weeks, Charlie Steen had staked 11 mining claims: the Mi Vida, Linda Mujer, Mi Amorcita, Mi Alma, Bacardi, Te Quiero, Fundadoro, Pisco, Besame Mucho, Mi Corozan, and the Mujer Sin Verguena. Another claim, the Ann, was staked later. Most of these mining claims were named after Spanish expressions contained in popular songs that Dad had heard in Peru. The Mi Vida claim literally means "My Life" in Spanish, but it actually means much more when it is used in the context of expressing one's feelings towards a woman.

Never was a mining claim more aptly named than the Mi Vida.

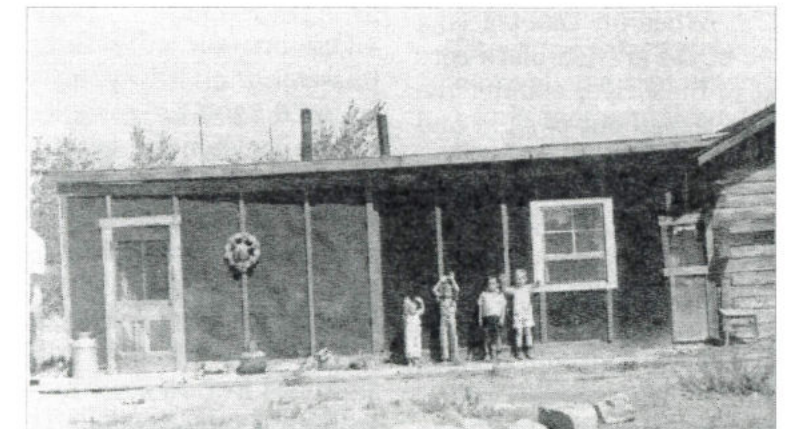
Charlie Steen filed his claims with the County Recorder in Monticello on March 7, 1951. Now that he had located his prospect, Dad had to convince someone to back his belief that uranium could be found beneath his claims, because the ore horizon was at least 200 feet below the surface and his portable drill could barely penetrate 50 feet. His theory was ridiculed and criticized by AEC geologists who were familiar with the country, and company geologists figured that they knew more about uranium ore deposits than some newcomer from Texas. Since all the experts unanimously agreed that the Big Indian country was worthless, it only stiffened my father's determination to prove them all wrong.

Dead Broke and Living on Hope

By this time the Steens were dead broke, so we moved to Tucson, where Dad worked as a carpenter and scraped together a small grubstake for another shot at prospecting. All the time he was in Arizona, Dad knew that

he had to do his assessment work on his Big Indian claims or lose them by default. With my mother's encouragement, Dad turned down a job offer to work as a petroleum geologist, sold the 20-foot trailer for \$375, loaded everything we owned into a small house trailer, piled into the red jeep and headed back to Utah. Along the way the Steens camped out every night, and at Mexican Hat, Utah, my mother caught a chill. By the time we reached Cisco, she had developed a severe case of pneumonia, and had to be hospitalized in Grand Junction. But when she recovered, all of the money my parents had saved was gone and they owed money for groceries and gasoline. We finally moved into a tar paper shack in Cisco, while Dad wrote dozens of letters to potential grubstakers.

Bill McCormick came through with a beat-up, second-hand drilling rig and enough money to bulldoze four miles of rough road into the heart of the Mi Vida claim. Rosalie Shumaker sold her furniture for \$1700 and came to Utah with a friend named Douglas Hoot to help her son find his fortune. Dad set the drill up as far down

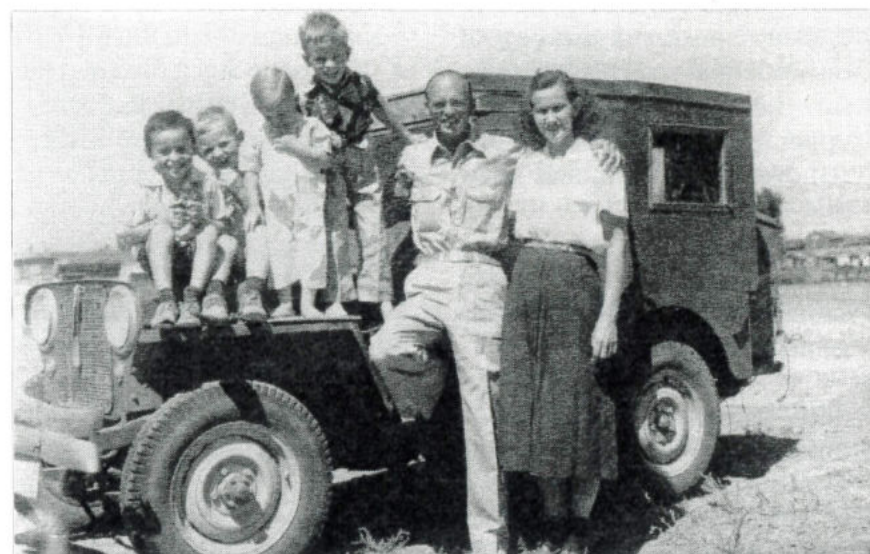


Mark, Andy, John and Charles Jr. stand in front of the Cisco shack. The Steen family was renting and living in half of it when Charlie made his discovery.

dip as possible and began drilling on July 3, 1952. After three days of drilling, at a depth of 73 feet, they started bringing up a grayish-black core that resembled coal. Dad and Hoot drilled through 14 feet of this unusual formation and my father set it aside to examine later. Three weeks later, on July 27, the drill bit suddenly broke off the drill stem at a depth of 197 feet—only three feet short of my father's goal. No yellow carnotite had been encountered.

Just about beaten from frustration, Dad drove the 100 miles to Cisco with the intention of going directly on to Grand Junction to get some tools to fish out the broken bit. He remembered to bring along several samples of the grayish-black core, and when he got to Cisco he drove straight to Buddy Cowger's service station to gas up on credit. Buddy was also a prospector and a good friend. Like practically every uranium prospector on the Colorado Plateau except for Charlie Steen, Buddy owned a Geiger counter; and he was examining some samples when Dad pulled up. Impatient to be on his way, my father said, "Hell, I've got some stuff that'll do better than yours." When my Dad placed a piece of the grayish-black core next to the Geiger counter the needle leaped out of sight and the counter went crazy.

In a flash of recognition, Charlie Steen realized that he had cored through 14 feet of pitchblende (uraninite), the primary mineral of high-grade uranium ore. Until July 6, 1952, nobody had ever found pitchblende on the Colorado Plateau, and my Dad had only seen specimens in museums, but he knew that the hole had finally



One of the family photos taken on the day of Charlie's discovery. From left to right: John, Charles Jr., Mark, Andy, Charlie and wife M.L.

come in for the Steen family. Dad whirled around and started running towards the shack where Mom was waiting for news from the Big Indian. After hitting her clothesline, he burst in the shack yelling: "We've hit it! We've hit it! It's a million dollar lick!" My father grabbed my mother and together they celebrated the discovery of the Mi Vida mine without knowing how profoundly their lives were about to change.

The Steens were about as broke as a family could be on July 27, 1952. We were living in a \$15 a month shack that was unencumbered with running water or electricity, my parents owed \$300 for groceries and a similar sum for gasoline, our clothes were threadbare and my father had tapped every possible source for a grubstake.

When my father arrived at Buddy Cowger's service station in Cisco, his spirit was at its lowest level in the two years he had been prospecting for uranium. The drive from the Mi Vida drill site back to Cisco had been the longest and most

agonizing in his life. Although he was determined to go on to Grand Junction to get some tools to fish out the broken drill bit, Dad knew that the chances were next to impossible of recovering the drill bit and continuing the drill hole on down to where he had projected the ore horizon would be encountered. The dilapidated drilling rig that Bill McCormick had purchased and thrown into the grubstake pot was only capable of drilling to 100 feet; and Dad and Hoot had pushed it down to 197 feet. But it was still 3 feet short of my father's goal, and they needed to drill through the ore horizon in order to have a really viable prospect. My father had driven directly to Buddy Cowger's instead of the tarpaper shack in Cisco, because he dreaded telling my mother the bad news about the drill hole.

The years of hunger, deprivation, worry and hard work had been tough enough on my Dad, but he had been pursuing something he had wanted to do all of his life. Mom

had been Charlie Steen's most loyal supporter. She had suffered the same hardships, but probably paid a higher price for her husband's determination. As much as Charlie Steen wanted to prove all of the skeptics wrong, he wanted to prove M.L. Steen's faith in him hadn't been misplaced. She alone had never doubted him.

In the instant that Buddy Cowger's Geiger counter had registered the radioactivity of the drill core sample, Dad had made a quick mental calculation and knew that he had struck it rich. When he burst into the miserable shack and shouted that he had found a million dollars worth of uranium, my mother believed him.

The Next Steps

After things calmed down, my father retrieved my grandmother, Rosalie Shumaker, and Douglas Hoot from the service station where he had left them when he ran to tell my mother that the hole had come in. The first thing that my father did was to confirm his belief that he had discovered uranium. Because he had been expecting to find yellow carnotite, Dad had not realized that the fourteen feet of greyish-black core he had first encountered at 73 feet was high-grade uranium ore. His geologic intuition made him set aside the grayish-black core and bring it back with him to Cisco. Now he used geologic education to confirm his discovery. Dad had always excelled at mineralogy, and now he closely examined the core samples. After he had compared the samples with the known characteristics of uranium

minerals, Dad tested the minerals using the mineral identification kit that he had carried with him since his freshman year in college. All of the tests confirmed that he had discovered uranium ore mineral, uraninite or pitchblende, which are really the crystalline and massive forms of the same mineral. In all of the high-grade uranium deposits known in the world at that time, these were the main ore minerals. With the confidence of his geologic knowledge and the fact that he had fourteen feet of uranium ore in his discovery drill hole, Charlie Steen took steps to record the moment. The Steens dressed up in the best clothes they had, and photographs were taken of us in front of the Cisco shack and assembled around the red Jeep. Only my two oldest brothers had shoes.

The next couple of months after my father's discovery overflowed with excitement and activity. On the basis of my father's conviction that he had hit the uranium jackpot, my mother borrowed some more money from her sister's husband, and Buddy Cowger extended my father's line of credit for gasoline and groceries. My Dad wisely figured that the 11 claims he had staked were not enough to protect his interest, so he returned to Lisbon Valley and began staking additional claims to cover more ground.

The first problem he had to deal with was the location of the Big Buck claims that he had tied on to when he first staked his ground in 1951. The original locators of the Big Buck claims had not bothered to set their posts more than 80 feet past the rim of the escarpment overlooking Big Indian Wash. But the Certificates of Location on file in

the San Juan County Recorder's office claimed several hundred feet of additional ground back towards the Mi Vida discovery drill hole. Working with Dan Hayes, my father and Douglas Hoot reset the corners for the Big Buck claim group and relocated the 11 original Mi Vida claims. Amended Certificates of Location for all of the Big Buck and Mi Vida claims were filed in Monticello, and everyone agreed to respect the new claim boundaries. This may not seem too important to someone uninitiated in the ways of prospecting and unfamiliar with the things an attorney can do with the mining laws, but this decision was to have far-reaching consequences when these same claims were jumped less than a year later.

My father staked another forty claims during this period, including six that he located in Douglas Hoot's name and three for Buddy Cowger. He helped Hawley Seeley stake three more to repay the Seeley family for their friendship and kindness when we lived on Yellow Cat and in Cisco. Bob Barrett was let in on the discovery, and he came up from Dove Creek and located eleven claims to the west of the expanded claim block. Later, my father and Barrett staked sixteen more claims that extended for nearly another mile and a half to the north, with my father and Barrett locating every other claim in sequence so they both ended up with eight claims each.

Since my father was certain that the uranium he had discovered had been structurally controlled by the Lisbon Valley anticline, he didn't bother to stake any ground below an elevation he called the "Steen Line." Although hundreds of

holes were eventually drilled on the thousands of claims that were staked below this elevation, no ore bodies were ever found in the Big Indian mining district outside of the trend my father first identified in 1952.

Things began to get complicated when Bill McCormick had to withdraw from their handshake mining partnership. It turned out that McCormick had a silent partner in the Dove Creek Mercantile Store, and his associate didn't want any more of their good money thrown into the expensive exploration drilling that would be needed to prove up an ore body. He demanded that McCormick recover their investment before Charlie Steen spent all of their money pursuing his dream of striking it rich. Bill McCormick was so cash strapped himself that he couldn't come up with the \$7,500 his silent partner wanted, so he offered to sell back their 49% interest for \$15,000.

Then Douglas Hoot, the machinist my grandmother had brought up from Texas to rebuild the rig and help with the drilling, decided that he wanted to return to Houston. Hoot said he would sell his six claims for \$100 to the first person that wanted them. My father was flabbergasted. These claims had been staked close in to the Mi Vida claim group, and were each potentially worth a thousand times the amount Hoot wanted for all six claims. Dad insisted that Hoot hold out for \$25,000 for each claim. Since there was no one willing to give Hoot \$25,000 for all six claims, let alone a single one, Hoot offered



This was one of the first pictures taken at the head frame at the new Mi Vida mine, 1953.

them to my father for the original \$100 figure he thought they were worth. Although my father argued and cajoled Hoot to hold on until the Mi Vida discovery could be proven, he couldn't be dissuaded from selling. Digging into his last-ditch emergency money, Charlie Steen paid \$100 for all six claims, and watched as Douglas Hoot caught the bus for Texas.

After the new claims had been located, my father sent samples of his drill core to the Atomic Energy Commission in Grand Junction for analysis. When no results were forthcoming, another sample was sent in for analysis in a third party's name. Both samples were "conveniently lost" at the AEC's laboratory. A third drill core sample was sent to a private

laboratory in Denver for chemical analysis. When the results came back they revealed an average of .34 percent uranium content with some of the core running better than 2 percent uranium oxide. These were so high that people refused to believe them. When my father announced his discovery and the high uranium content of his drill core, the AEC and all of the established uranium company geologists reacted with open disbelief. Employees of the same government agency that was supposed to encourage the kind of discovery Charlie Steen had finally made accused him of salting the drill hole with pitchblende from Canada. They began to call my father's prospect "Steen's Folly" and referring to him as the "Cisco Kid" behind his back.

Making the Announcement

After trying to raise money in Salt Lake City, Grand Junction and Houston, my father drove to Denver in August to try to promote some mining machinery on credit or for an interest in his discovery. He couldn't, but he dropped by the *Denver Post* and told them he had a good story. Dad hoped that someone would read the story and take a chance on investing. Like everybody else, the newsman was openly skeptical of my father's claim of having found a uranium fortune. The story was held up for several weeks after someone the *Denver Post* contacted at the AEC insisted there could be no uranium where Steen said he made his

strike. When the *Denver Post* finally ran the story on August 30, 1952, it was considerably less positive or personal than the typed version of my father's announcement. The *Denver Post* left off the following text: "The many people who at various times in the past two years refused to risk their money on my venture need not approach me with offers of financial aid when I no longer need it. Finding the ore was relatively easy; raising the money necessary to finance the exploration program was the difficult task. As a geologist I am very happy that my discovery results from my ten years of field experience. As a prospector, I am glad that the hard two years of search is at an end. The hardships and privations that my family and I endured in order that I could make this discovery should prove that my family and I earned this reward."

A few days after the *Denver Post* published its closely worded story about my father's Big Indian uranium discovery, Moab's *Times-Independent* ran an article based on the same announcement that Dad had given to the Denver newspaper. Although the *Times-Independent* article actually contained more details about the high-grade nature of the uranium mineralization contained in the discovery drill core, not a single person among the newspaper's readership expressed any interest in helping Dad develop his prospect. None of the area's long-time uranium prospectors and miners were convinced that Charlie Steen had really found a

uranium bonanza. Folks laughed when they heard that someone from Texas was claiming to have discovered a million dollars worth of uranium in a mining district that everyone knew the experts had already examined and written off as a loser.

In early September, Dad received a letter postmarked Casper, Wyoming from William T. Hudson, his former boss at the Chicago Bridge and Iron Company's Houston, Texas office. Bill Hudson had overseen the college loans that my father worked off during the summers and had written to congratulate him after reading the *Denver Post* article.

Dad immediately telephoned Bill Hudson and explained the situation. He told Hudson that McCormick's interest was available for \$15,000 and that he needed at least another \$35,000 to prove up the ore deposit.



In 1954, Charlie Steen, son Mark, and Butch the dalmatian down in the mine.

Hudson, a family man, told my father that he couldn't risk more than \$5,000. But he was still associated with Dan O'Laurie, another of Dad's old bosses at Chicago Bridge and Iron. Hudson approached the thrifty O'Laurie about raising the necessary money. A day later Dan O'Laurie flew down from Casper to size up the proposition.

After he saw the drill core samples and verified the chemical analysis results, O'Laurie caught some of Charlie Steen's enthusiasm for his uranium prospect. He put up \$15,000 and agreed to loan the venture another \$30,000. Hudson came across with his \$5,000 and Bob Barrett chipped in another \$4,500. Dan O'Laurie and Bill Hudson bought out Bill McCormick and his cautious silent partner while my father considered his options.

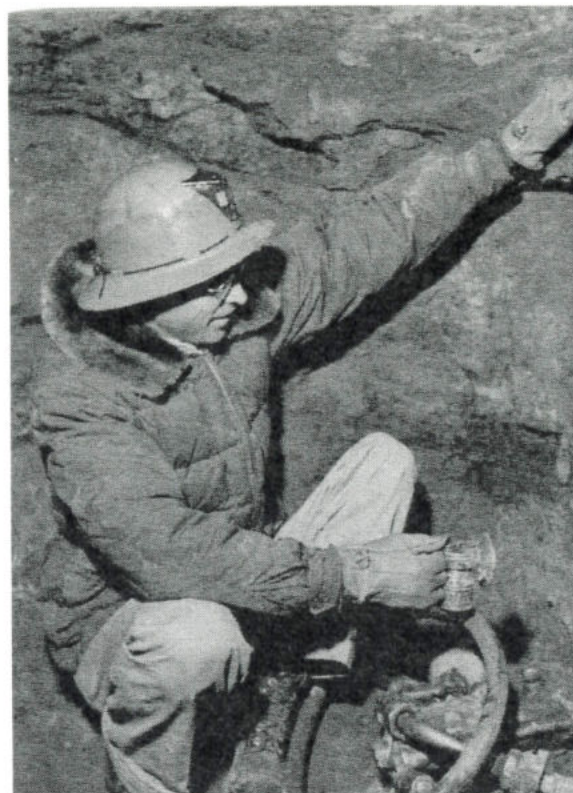
Instead of spending all of the remaining capital drilling more holes to block out the ore body, Dad decided to gamble all of the money to sink a shaft down to the uranium indicated by his single discovery drill hole on the Mi Vida claim. It was bad geology but good economics, because if they had drilled more exploratory holes they would have been out of money; but a shaft would enable them to begin production immediately.

A small crew of miners was hired and a head frame and hoist house were constructed, along with a bunkhouse and cook shack. On October 4, 1952, a six-by-eight foot shaft was started thirty feet southeast of the discovery drill hole.

While my father examined and recorded the geology, Bob Barrett oversaw the shaft sinking, and my grandmother, Rosalie Shumaker, did the cooking. Dan O'Laurie moved to Moab and handled the finances, and Bill Hudson anxiously awaited the results in Wyoming. My mother and brothers and I continued to live in Cisco where our friends, the Cowgers and the Seeleys helped Mom get along during Dad's absences.

Two weeks later, my father drove into Moab and introduced himself to Mitch Melich, the only lawyer in town. He wanted to form a closely held corporation and he wanted to name it the Utex Exploration Company after the two states of Utah and Texas. Melich agreed to incorporate the company and come on board as corporate counsel in exchange for a small percentage of Utex stock.

In retrospect, it was a good thing that Moab didn't offer Charlie Steen a large selection of attorneys to choose from, because Mitch Melich brought a lot of experience and ability to Utex. Melich had grown up in the copper mining town of Bingham Canyon, Utah. He had worked for Kennecott as a young man during the summers in order to pay his way through college. More importantly, he was married to Ed Snyder's daughter. Snyder had been involved in mining for decades, and he had many years of experience in metallurgy and mineral processing as president of the Combined Metals Reduction Company. Mitch Melich and Charlie Steen liked



Charlie Steen shows off the large pitchblende deposit in his mine. Note the old carbide lamp he was still using at this early point in time.

one another immediately. Melich became my father's closest ally in the many negotiations and mining deals that followed this initial meeting.

The Utex Exploration Company was formed on October 24th, with Dan O'Laurie as president; William T. Hudson, vice-president; Robert M. Barrett, vice-president in charge of mining operations; Charles A. Steen, chief geologist and secretary-treasurer; and Rosalie Shumaker as assistant secretary-treasurer. Dan O'Laurie's closest friend, Allan P. Darby, was later appointed assistant to the president. My father and his mother retained 51 percent of the corporation's 50,000 shares in exchange for Dad's contribution of twelve of his mining claims.

Because the soft sedimentary rock formations had to be timbered and the waste rock hand mucked and hoisted to the surface in a quarter ton ore bucket, the shaft sinking progressed very slowly. Finally, at a depth of 68 feet, the miners blasted into the Mi Vida ore horizon. My father and his mother and their partners gathered around the slowly growing ore pile at the base of the head frame and handled and examined the heavy uranium ore as it was brought to the surface in the ore bucket.

When the miners had mucked out the last drill round that had penetrated the Mi Vida ore deposit, my father excitedly climbed down the shaft ladder and found himself surrounded by the same grayish-black formation he had pulled up in his drill core back in July. It was the first time any geologist had ever seen such high-grade uranium ore on the Colorado Plateau. This was the reward for years of hardship and privation. This was the fulfillment every prospector dreams of when he sets out to find a fortune. It was the first day of December, and it was Dad's thirty-third birthday. Charlie Steen had truly struck it rich!

(The second part of this story of Charlie Steen and the Uranium Boom will be in the next Canyon Legacy issue.)



Happy at Happy Jack

Mining Camp Life From a Woman's Point of View

by Dorothy Rossignol

Dorothy Rossignol was born in Niagara Falls, New York, where her father, Roscoe E. Jackman, was a research chemist for DuPont. He was laid off when the Depression hit and had to move his family to his parents' farm near Missoula, Montana. Dorothy had been born almost two months early and lost even more weight after birth. Because of her tiny size, her mother and the two older children traveled to Montana on the train even though the family doctor in New York didn't believe Dorothy would live. By nine months of age, she had still never raised her head off of the pillow. Dorothy's father was only able to get a job as a janitor at the local school even with his Ph.D. But the family survived the Depression, grew to include four children and stayed in Missoula. Finally, grown up and out of high school, Dorothy decided to see the world.

"I went into the United States Navy during the Korean War. I had decided to go see a recruiter and the Navy, who came first, thought I was okay. But I wasn't twenty-one yet, so they gave me papers and said that I had to get my father to sign. I think the hardest thing I ever did in my entire life was to ask him to sign those papers but I finally got nerve enough to ask him. And

that was the first time I ever saw him cry. Away I went to Great Lakes, Illinois, for training and then to Norfolk, Virginia for schooling. That's where I stayed.

I was in the Personnel Department so I knew where every ship in the Navy was and what they were doing there. I had a top clearance and the code to the safe in the office. This was in the 50s and we didn't have electric typewriters, computers, cell phones or copy machines. Everything was one original and seven copies - lots and lots of carbon paper. You didn't make a mistake because, if you did, you got out an original and seven copies. You didn't erase.

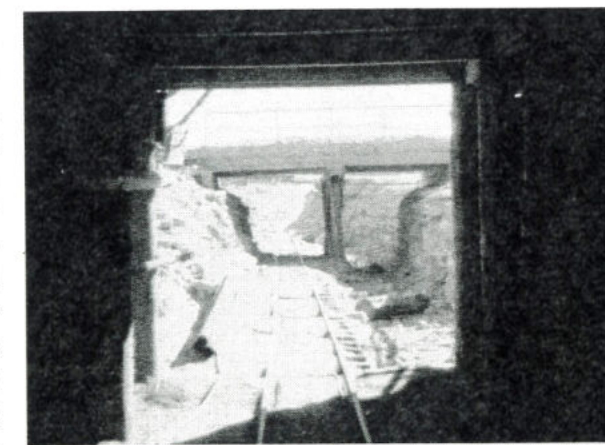
I did a lot of typing and I was pretty good at it. I was in the Navy for three years, nine months, and twenty-seven days, the majority of time on land in an office.

Afterward, I returned to Montana. I was living with my

folks and the family that lived across the street was moving to Ovando, Montana, where a logging camp was located. I helped them move and that's where I met my future husband, Bob Rossignol. He was cooking in the cookhouse of the logging camp that cut stulls (large timbers) for the Butte mines. He invited me to come to the cook shack and have lunch with him. He baked his own bread; he cut his own meat; he did all the pies and cakes. Well, I've never been a cook and I never will be. I thought, "Hmmm...a cook ready-made." He eventually invited me to go to the Ovando dance. (This town had about as many people as Thompson has.) He said that he needed a kitchen helper but that I didn't have to cook, so I went to work for him washing dishes, setting the tables, peeling potatoes, and doing the laundry. They had all the facilities. I knew him just about 4 months when we were finally married.

I didn't know at that time that he wanted to go back to the mines. I thought I had it pretty well made with him making homemade cakes and pies and he could cut up a quarter of meat in just nothing flat. One day he says, 'Well, I think I'll go back mining.' I said 'Go back?' 'Oh, yeah, I just do this temporary.'

That started our life of moving from spot to spot.



Coming out of the Happy Jack Mine. All photos courtesy of the author, Dorothy Rossignol.

Our first anniversary was in Clearlake Oaks, California. Then we were in Guerneville and Jenner by the Sea. He mined tungsten and mercury in Nevada and California, but everywhere we went, the mines were closing. We lived in five states in one year! But miners like mining. I don't know why. It kind of gets in their brain or their system, and most mines are nice places to be in the winter when it's cold and nice places to be in the summer when it's hot.

We moved to Utah, to Deer Flats which is close to the Bear's Ears near Monticello, in 1956, and we were there for a couple of years working for White Canyon Mining Company at the Hideout Mine. It was a uranium camp that had housing, but I was the only woman. In fact, in a lot of these camps, I was the only woman. Back when we were in mining, women did not go underground. There were some of the old timers who would not go back in a mine if a woman ever went underground, even if she just walked around. At White Canyon at Deer Flats, there were just two men and the boss in the mine. It was just a little mine. Bob was contract mining and I used to make the primers that set off the dynamite. Because the men were contract miners, they didn't want to take their time from mining to make those. I had to do it underground, but they had a little hole cut out – not the main entrance to the mine. The fuses and the caps and supplies were in there. They couldn't have them in the mine; it might blow up the place. But they didn't worry about me! There was a bench with little notches for short, long, and different size fuses. I'd lay out and hold the primer and



A long view of the trailer camp used at the Happy Jack Mine site. Note the little Recreation Building at the end of the "Main Street" and the isolation of the camp.

measure for the short or long and then I had to crimp the fuse on it. I had to be very careful because you didn't want to pinch the wrong end or you'd have been blown up! I only did this at White Canyon because there was nobody around to know that a woman was doing it. The only time I would get to go in a mine was on a day off when nobody else was around and Bob could sneak a little peek and show me what he was doing.

When we were at Deer Flat, the little houses were up on a ledge and the Hideout Mine was down below. Of course, they had bells for what they were doing. Three was "Somebody is on the cage" and they were coming up or something. Bob would come home for lunch and when I'd hear the bells then I'd know just how long it would be until he would come to lunch.

Then we went to Happy Jack. Happy Jack was a big company camp. Originally, two fellows named Bronson and Cooper from Monticello had discovered and mined it, but eventually they sold it to Texas Zinc. We went there after the big boom, but it was still being mined.

Happy Jack was a nice camp. My husband would put in an eight-hour day and the men would work ten days on and then have four days off. That way, we had plenty of time to go into town when banks and shops were open to do our business. Everything was contract work. I don't remember exactly what wages were at that time but I know they didn't take much out for Social Security back in those days. Bob would have his annual Social Security paid by July and they only took it out up to \$5000 or so. Mining was good money.

The biggest population at the camp was during the summer when the wives and children were there. They had two rows of trailers all lined up in a row that could house twenty to twenty-five families. Everybody had their own trailer and most of them were families, although some were bachelors. The families usually lived there in the summer but, because we had no school, the women who had school-age children moved back to their homes in Monticello, Cortez and Mancos for the school year. They had a school at Fry Canyon but it was

only for the little ones. When they got into high school, back to town they went. So again, because Bob and I had no children, a lot of times I was the only woman at the camp.

We had electricity and we had running water in the trailers. We also had a maintenance man that took care of all the air conditioning and things like that. It cost us \$25 a month to rent those trailers and that covered utilities and everything. Water was hauled from Fry Canyon, about 12-15 miles from the spring. You did not waste water. You didn't wash your car. We had laundry facilities, a wash house. Each woman had two hours twice in the ten days her husband worked to do the family's laundry. Wash it and get it outside on lines to dry

There were some women there during the winter that didn't have children so they could stay. I got a job taking care of the "guest house." When the big shots would come, there was a trailer for them to stay in and I would do the laundry and clean the trailer. And when the First Aid teachers came to teach the men how to take care of people if they got hurt, I fed them and they stayed in the guest trailer. This was the same kind of trailer as those of the miners, but it was bigger. It had three bedrooms instead of just two so that if they had several guests, there would be a place for them.

We were one of the few places in the whole United States where you could get an airmail letter for a 3-cent stamp. You sent it for 3 cents and you got it for 3 cents. By air was the only way we could get our mail. The little plane would come to Fry and get our mail and go down to White Canyon and drop their

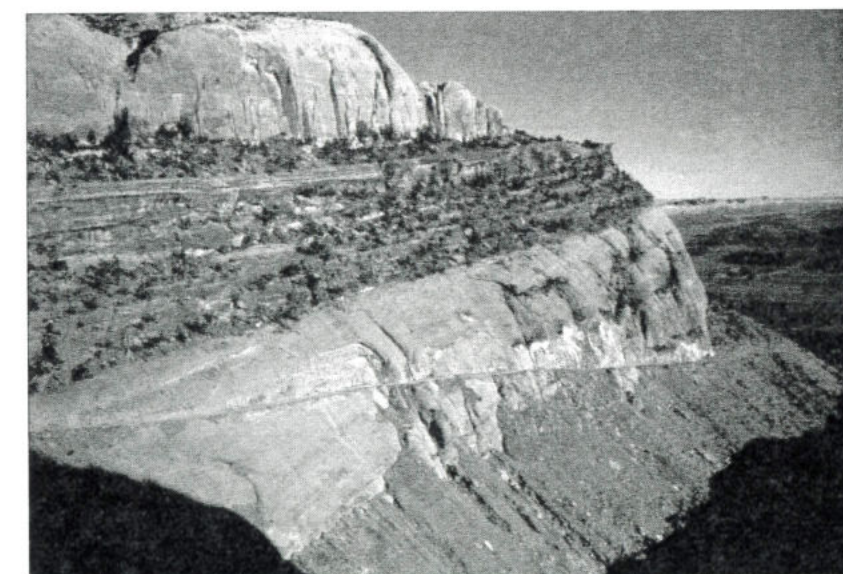
mail and go on back. We got our mail that way three times a week - Monday, Wednesday, and Friday.

Fry Canyon had a store just about the size of Dave's Corner Market, very small, where you could get milk and just a few things. There was not much meat, but you could get things that didn't require freezing. You could survive. You had to go twelve miles to get beer. Your big shopping was either in Monticello, Cortez, or Moab. (Almost everyone lived in Monticello, Dove Creek, or that region because that's where the boss came from.) We did most of our major shopping in Monticello.

In the wintertime, we didn't travel a lot because we lived 71 miles from Blanding and all of the way was on dirt roads. If we had more than one flat tire on the trip, it took a long time to get there. When you go by the Natural Bridges and some of those places, you are quite high in altitude. It's desert, but still high and there was lots of snow back then and plowing was not

very steady. We didn't come out; we would stay in three months at a time. We'd send our grocery list and a check with some of those die-hard guys that had four-wheel drive and big vehicles and they'd bring our groceries back.

The only time we came to Moab was if we went out across the ferry and went out to Hanksville. Sometimes we'd go to Grand Junction and then we'd go back through Moab and to Blanding that way. We crossed the washes between the ferry and Hanksville sixty-three times. There were no bridges and no culverts. You'd go up and down and up and down. That's why you didn't go when it looked like rain! You didn't know what was tumbling down those washes during flash floods or how deep it was, yet there were people who'd try to go through. We've sat on one of the 'ups' for seven hours waiting for the water to go down from a flash flood way up the country. If you are stuck so that there's a wash running in front of your car and while you are up here, the back side starts



The road to town was frightful during bad weather and this grade on Comb Wash could become impassable for all but the foolhearted.

running, then you are just there until the water goes down. But you can wait thirty minutes and then it's dusty and you can go. If you drove into the wash with water in it and you lost your car, the insurance companies would not pay for it. But if you were in the wash and the water came, then the insurance company would pay for your car. That's the way it was.

My husband's specific job at the mine was as a motor-man. He drove the train in and out of the mine to bring the ore out and dump it. The trucks would run under this big bin and they'd open it and fill them up. Then, when everything got full up there, we had our 'Million Dollar Backstop' where we played ball in the summer. They said each one of the uranium piles was worth a million dollars. We probably were getting contaminated but it didn't hurt us, I guess. It was outside and it wasn't milled. It was just raw ore.

There wasn't enough of us to have two baseball teams most of the time, so we played work-up. For other fun, the company built us a recreation hall. It was just a building and we used to have movies there. The plane would bring in the movie once a week on Wednesdays. Some of them were silent movies and some were pretty old. Every movie night, two families, or two women, would make popcorn so we could all have popcorn with our movie. We'd trade off. Then we'd have suppers, kind of like potlucks, especially at holiday



A party at the Happy Jack camp recreation hall. Even though it lacked chairs and good light fixtures, it provided a community gathering place.

time, if the guys couldn't get off to go home. Sometimes the families would come down for holidays and then we'd really have a big potluck. We always had a party at Christmas. These get-togethers were all held in the community recreation hall, and it was always 'BYOC' (bring your own chair)! You had to bring your own chair because they didn't have any furniture. We had several fellows who played banjo, accordion, and other instruments and we'd have music and dancing. When there weren't many women in camp, the men used to have to dance together.

We were just one big happy family. Everybody got along in camp because you had to. You learned to talk to each other because we had no radio, no telephone, and no TV. Sometimes there would be just a couple of families there, especially at the end of the ten days. Someone would say, 'Well, I've got a little salad,' 'I've got a few potatoes,' 'I've got an extra piece of meat,' or something and so we'd get together and have

potluck. Everybody would bring what they had. It was fun.

It was mostly the same people and the same neighbors while we were there. There wasn't a big turnover in personnel because it was just like in a restaurant here in Moab. If the employer was good to their employees, nobody quit. Things were going smoothly.

We were very fortunate that no one was seriously injured. I don't know how we would have

gotten them out unless somebody just took them. There were radios in some of the vehicles, but they had to drive way up on top of a hill to get a signal out. Then maybe we could have gotten an airplane to come in to the little landing strip at Fry which was twelve miles away. We would have had to get them down there to get on the plane, though. I don't remember any helicopters in the area; this was back in the 1960s.

Without TV, news or anything else, we kept up with what was going on in the country in general and in the uranium market through the office. The men would meet with the bosses and they came and went quite a bit. They also had the radios that they could use by driving up on the hill and they could connect with the home office. We didn't need to know everything, but when we went to town in nice weather, we'd get a motel and, boy, we watched television! Even after we moved from the Happy Jack to Green River, the first thing we did was buy a television. Everybody said, 'All they've got are re-runs.' But they



The "\$1,000,000 backstops" were piles of ore that were lined up in a holding area until being shipped out. Three of them are seen in this picture.

weren't re-runs to us. We'd never seen them before.

Another thing about living in a camp such as Happy Jack is that you get to know your spouse. You talk to them. Nobody is watching television or listening to the radio. You can't go fishing because there's no place to go. We did a lot of hiking and walking down in the canyons. When the men worked, they worked hard, and didn't feel like doing a lot. You couldn't say, 'Well, let's go to Blanding and see a movie tonight' because that would be 140 miles round trip. In the dark, on those roads? No, thank you!

We were at Happy Jack from 1959 to 1963, about four years out there away from everything. When we left, the mine was closing down. Atlas had bought it but everybody was leaving. Texas Zinc had some property somewhere between Green River and Hanksville and everyone was going to go up to work there near Green River, so that's where we went. We bought some land and were going to put in a trailer park for all of the employees, but,

unfortunately, Texas Zinc went down 20 feet, then shut down, and folded up. Nobody had a job and that's when uranium was on the way out."

Fortunately for the Rossignols, Bob could find work as a cook again, this time at the new missile base near Green River, and Dorothy also put her clerical skills to work. The couple eventually moved to Moab, the "Uranium Capitol of the World," in 1969. After working for awhile on the I-70 construction, Bob went back to mining once again, this time for

Atlas. Because, as Dorothy said earlier, "miners like mining."



Dorothy Rossignol currently lives in Moab and works at the Museum of Moab, not only as a weekend receptionist, but also as a volunteer for many of the events. Her story of the uranium era shows the other side of the boom, where families and camps were strewn across the desolate Colorado Plateau.



Trucks create the huge ore piles used by the Happy Jack residents as their backstops when playing baseball.

The Uranium Industry in Southeastern Utah

by William L. Chenoweth

Uranium has been a commodity of great importance to the economy of southeastern Utah since the early 1900s. Early mining was for the recovery of radium. Later, the associated vanadium in the carnotite deposits became important. The greatest amount of mining and processing took place during the 1948-1970 procurement programs of the U.S. Atomic Energy Commission (AEC). Beginning in 1971, all uranium concentrate produced in the United States has been processed for use in nuclear power plants for the generation of electricity. Since 1983, the industry in Utah has been declining and the last operating mill and mines closed in 1989. Recent increases in the price of uranium concentrate have

created a new boom and the mills and mines may soon be operating again.

THE RADIUM ERA

In 1898, Marie and Pierre Curie discovered that all uranium ore contained the new element radium. During that same year, the yellowish colored material coating the rimrock of Paradox Valley in southwestern Colorado was found to contain uranium. A sample of this yellowish material was sent to France where it was found to also contain the element vanadium. Thus a new mineral, carnotite, was named after the French mining engineer and chemist, Adolph Carnot. Experiments showed that radium showed the growth of

certain cancer and radium salts glowed in the dark, and a market for radium developed.

As soon as it became known that the yellow material was valuable, many claims were staked. The first claims staked in Utah for carnotite were along La Sal Creek in San Juan County, and northeast of Moab at Richardson in Grand County (Figure 1).

When Boutwell visited southeastern Utah in 1905, he reported that more carnotite had been located near Green River, Thompson, at Mill Creek near Moab, in the San Rafael Swell, and north of the Abajo Mountains (Figure 1). A shipment from the Richardson deposits was made to Buffalo, New York, in 1904.¹

Shortly before 1910, metallurgical processes for relatively large-scale recoveries of radium from carnotite ores were perfected. The improved processes greatly increased the demand for carnotite and accelerated prospecting in southwestern Colorado and southeastern Utah. About one gram of radium is present in every 200 - 300 tons of ore containing 2.0% U_3O_8 .

About 1913, the carnotite deposits in southwestern Colorado and southeastern Utah became one of the world's principal sources of radium. For

about 12 years, these deposits were mined for radium with uranium and vanadium as by-products. Some ore was upgraded at a plant near the present site of Uravan, but the majority of the ore was shipped to Canonsburg, Pennsylvania, Denver, Colorado and New Jersey for treatment. Because of the increasing demands for vanadium, radium plants were engineered to recover quantities of vanadium as a byproduct from carnotite. With the entry of the United States into the war in 1917, emphasis slowly began to shift away from the production of radium to the production of vanadium. By 1922 Colorado Plateau ores were no longer competitive with newly developed high-grade pitchblende ores in the Belgian Congo (now Democratic Republic of the Congo) as a source of radium.

The end of the war caused both a drop in the demand for vanadium and a resumption of production from lower cost areas. Mining and milling of carnotite ores ceased around 1923 and was not resumed in most districts of southeastern Utah until 1936.

From 1910 to 1923 the Colorado Plateau carnotite ores are estimated to have yielded 202 grams of radium with small amounts of vanadium and uranium recovered as by-products.² Utah's share of this production was probably 12-15 grams.³ High-grade ore was produced near Moab, along La Sal Creek, in the Henry Mountains, at Temple Mountain, and near Thompson.⁴ During this period, the world market price for elemental radium in purified salts, ranged from \$70,000 to \$180,000 per gram.⁵

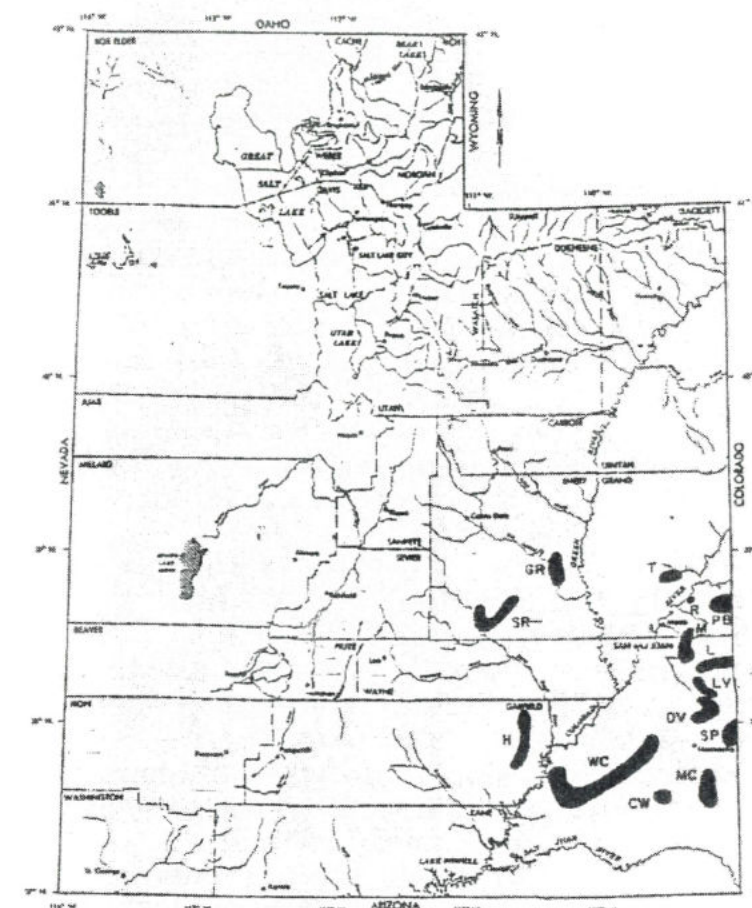


Fig. 1 Uranium producing area in Utah, mentioned in text. R- Richardson, L- LaSal, GR- Green River, SR- San Rafael, T- Thompson, H- Henry Mountain, DV- Dry Valley, CW- Cottonwood Wash, MC- Montezuma Canyon, M- Moab, LV- Lisbon Valley, SP- Sage Plain, WC- White Canyon, PB- Polar & Beaver Mesa

THE VANADIUM ERA

Nearly all carnotite deposits of southeastern Utah and southeastern Colorado occur in sandstone beds of a unit later named the Salt Wash Member of the Morrison Formation of Jurassic age. In Utah, early discoveries at Temple Mountain in the San Rafael Swell, were in sandstones later included in the Triassic Chinle Formation, and the deposits at Richardson occurred in sandstones to be later mapped as the Wingate Sandstone.

After a period of comparative inactivity, the rising demand for vanadium by the alloy-steel industry renewed interest in the deposits. Most of the established mines were reopened by 1936. Prospecting increased and many new mines were developed throughout southeastern Utah. Vanadium mills were built near Blanding by Blanding Mines Co. and in Dry Valley by International Vanadium Corp. Cornelius Ekker and Ray Bennett built a small upgrader at the Trachyte

Table 1. Uranium - vanadium ore produced in southeastern Utah for the U.S. Atomic Energy Commission, 1948-1970. From unpublished AEC records, Grand Junction, Colorado office.

COUNTY	TONS of ORE	POUNDS U_3O_8	% U_3O_8	POUNDS V_2O_5	% V_2O_5
Emery	1,102,747	5,343,289	0.24	5,722,124	0.53
Garfield	61,175	467,195	0.38	1,491,933	1.66
Grand	486,420	2,733,805	0.28	9,164,091	1.25
San Juan	10,266,121	68,596,396	0.33	46,059,095	0.60
TOTALS	11,916,463	77,140,685	0.32	62,437,243	0.61

Ranch in the Henry Mountains. The plant used a slime-sand separation to upgrade the ore before it was shipped to a mill. In late 1940, Vanadium Corp. of America (VCA) opened a vanadium ore buying station at Monticello, in order to stimulate mining. Within a short time, ore production increased sufficiently to justify construction of a vanadium mill. In September 1941, the War Production Board approved VCA's proposal to build a mill. Funding was provided through the government's Defense Plant Corp.

The United State's entry into World War II in December 1941 gave the vanadium industry new impetus. In order to stimulate the production of strategic materials, the Federal Government formed the Metals Reserve Co. (MRC) in 1942. Vanadium was one of the strategic materials, and MRC began an ore purchasing program and increased the base price. The mill planned for Monticello would be operated by VCA for MRC. Actual construction started in February, and on August 24, 1942, the first vanadium was produced.⁶

In order to insure a steady supply of ore for the Monticello mill and mills in southwestern Colorado, MRC established ore-buying stations and stockpiled ore for distribution. In Utah, these stations were located at Thompson, Moab, and Monticello. These ore-buying stations were operated by U.S. Vanadium Corporation for the MRC. The Metals Reserve program, which lasted from 1942 through February 1944, greatly stimulated prospecting, and many new deposits were found. After the termination of

the program, vanadium mining nearly ended in southeastern Utah.

Mines in southeastern Utah produced 100,369 tons of ore averaging 1.88% V_2O_5 and containing 3,770,000 pounds V_2O_5 during the period 1924-1943.⁷ An additional 9,285 tons of ore were produced during 1944-1947.⁸ Most of the ore came from the Dry Valley, Cottonwood Wash, La Sal Creek, Thompson, Montezuma Canyon, Moab, Polar and Beaver Mesas areas.⁸

MANHATTAN ENGINEER DISTRICT

In December 1942, the Manhattan Engineer District (MED) of the U.S. Army's Corps of Engineers made a survey of the vanadium operations on the Colorado Plateau. Their purpose was to determine the amount and availability of the uranium that was contained in the tailings at vanadium mills.

In Utah, a contract was signed with MRC in January 1943 to produce uranium - vanadium sludge at Monticello. MRC was to be paid \$1.10 per pound for U_3O_8 and \$0.90 per pound for V_2O_5 contained in a sludge consisting of 50% U_3O_8 and 25% V_2O_5 . The sludge was shipped to the Vitro Manufacturing Co. at Canonsburg, Pennsylvania, for additional processing.⁹ Tailings from the Monticello mill were considered by the MED to be too low in uranium for additional processing.¹⁰ In February 1944, MRC closed the Monticello mill and ceased production of both fused vanadium oxide (V_2O_5) and the U-V sludge.

In 1945, VCA leased the Monticello mill from the

Defense Plant Corp. and purchased the remaining ore stockpiles from MRC. VCA processed the stockpiled ore plus ore from other sources, and sold a U-V sludge to the MED until the mill closed again in 1946.⁶ Based on all available information,^{10,11} I have estimated that MED acquired some 213,000 pounds U_3O_8 from the Monticello mill.

At Moab, the Vitro Manufacturing Co., through its local ore buyer, Howard Balsley, had been acquiring high-grade carnotite ores for the manufacture of ceramic colors, etc. MED contracted with Vitro to purchase their Moab stockpile of high-grade ore containing approximately 52,000 pounds of U_3O_8 for \$71,880.¹¹ At Blanding, MED contracted with the Blanding Mines Co. to purchase the tailings at its vanadium mill. These tailings were hauled to Durango, Colorado to be processed to recover the uranium.

During World War II, the Manhattan Engineer District, under the direction of the Army Corps of Engineers, had been charged with the development of atomic weapons. Its activities included research and development, engineering and design, the operation of production facilities for weapons materials and components, and the acquisition of uranium for the production of nuclear weapons.

All of the MED functions, and the numerous government-owned facilities in which many of them were performed, were transferred to the Atomic Energy Commission (AEC) by Executive Order 9816, effective at midnight, December 31, 1946. The creation of the AEC

Table 2. Uranium concentrate produced in southeastern Utah for the U.S. Atomic Energy Commission 1949-1970 (6)

Location	Capacity ¹	Operator(s)	Years	Pounds U_3O_8	Cost of Lb (\$)	Total Cost (\$)
Monticello	400	The Galigher Co. National Lead Inc.	1949-1956 1956-1960	4,583,028	9.92	45,477,894
Hite	20	Vanadium Corp. Amer.	1949-1953	128,145	13.93	1,785,622
Moab	1,000	Uranium Reduction Co. Atlas Corp.	1956-1962 1962-1970	40,242,688	8.07	324,594,678
Mexican Hat	1,000	Texas Zinc Mineral Corp. Atlas Corp.	1957-1963 1963-1965	9,642,021	9.02	86,926,448
Total				54,595,892	8.46	461,784,642

transferred the development of atomic energy from a secret military organization to a civilian agency, whose general activities were a matter of public record.

SUMMARY OF THE AEC'S PROCUREMENT PROGRAMS

The procurement aim of the AEC was to purchase uranium in concentrates. Its first uranium procurement action was execution of a contract with Vanadium Corp. of America (VCA) on May 28, 1947, for the delivery of concentrates from its mill at Naturita, Colorado. This was followed by contracts on October 2, 1947 and April 13, 1948 with United States Vanadium Corp. (USV) for delivery of concentrates from its mills in Rifle and Uravan, Colorado.

It was obvious that production of concentrates was directly dependent upon an assured supply of uranium ores, which required a rapid expansion of exploration and mining efforts. The AEC

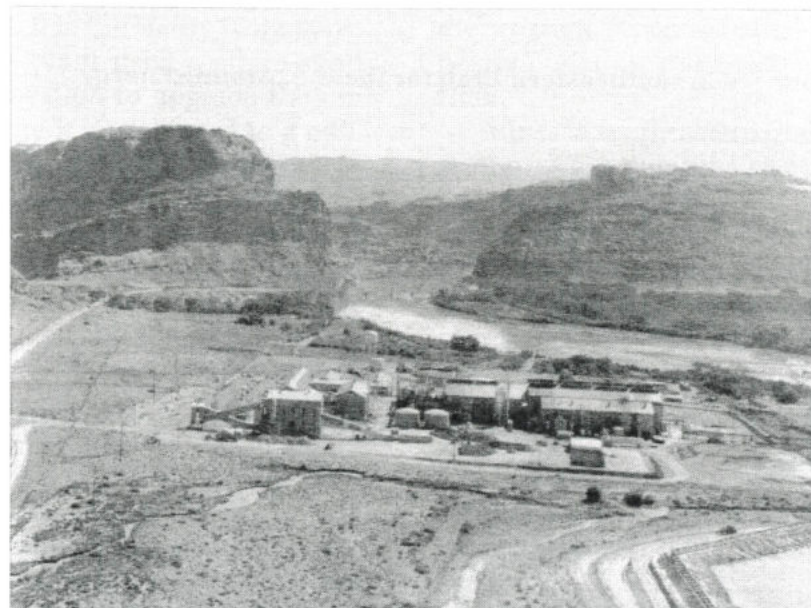
announced a domestic procurement program designed to stimulate prospecting and to build a domestic uranium mining industry in April 1948. Private industry would be tasked with finding, mining, and processing uranium ores. The AEC would assist by making geologic surveys, furnishing free testing and assaying services, and, most important, guaranteeing the market.

In order to increase ore production, the AEC issued a series of circulars. These circulars provided a base price or ore, a premium price for high grade ore, a haulage allowance, vanadium payments, \$10,000 bonus for 20 tons of 20% U_3O_8 non-carnotite ore and a \$35,000 bonus for new discovery. All of these circulars set the stage for a massive search for uranium throughout the western United States especially in the Four Corners area.

The search for uranium was so successful that on May 24, 1956, the AEC announced the establishment of a new domestic uranium procurement program for the period April 1, 1962

through December 31, 1966. The new program guaranteed a Government market to 500 tons of U_3O_8 in concentrate, per year from any one mining property or operation at a flat price of \$8 per pound. Thus, in 1956, the stage was set for a continuing AEC concentrate procurement program after March 31, 1962, with an established price of concentrates rather than for ores. The prices, premiums, and allowances paid under Circular 5, Revised, would no longer be in effect. After March 31, 1962, the AEC required that the mill operator pay "reasonable" prices to independent producers.

By late 1957, dramatic increases in reported ore reserves and in milling capacity prompted an AEC announcement that "it no longer is in the interest of the Government to expand production of uranium concentrate." Then, on November 24, 1958, in order to prevent further expansion of production under its essentially unlimited purchase commitment, the AEC redefined its 1962-1966 procurement program by withdrawing portions of



The Atlas Mill as it appeared while in production from 1956 until shutting down in 1988. The tailings pile can be seen in the lower right. At full capacity, the mill employed about 500 people and was the major contributor to the development of Moab's infrastructure. Photo courtesy of the Dept. of Energy.

the program announced in May 1956. The Government stated it would buy, in the 1962-1966 period, only "appropriate quantities of concentrate derived from ore reserves developed prior to November 24, 1958, in reliance upon the May 24, 1956, announcement." Other aspects of the program announced in 1956 were retained: the AEC would buy only concentrates; the U_3O_8 price would remain at \$8 per pound; and ores would not be purchased nor ore prices guaranteed. Independent producers had to negotiate ore purchase contracts with milling companies in ore to sell their ores.

The November 24, 1958 announcement effectively shut down exploration activities in the industry. In 1962, it was apparent to the AEC that the private market for uranium concentrates would not be sufficient to sustain a viable

domestic uranium industry at the end of 1966 when the AEC procurement program was scheduled to end. Thus, on November 20, 1962, the AEC announced its "stretch-out" program for 1967 through 1970. Under the program, the milling companies could voluntarily defer delivery of a part of their 1963-1966 contract commitment until 1967 and 1968 in return for an AEC commitment to purchase an equal amount of U_3O_8 equal to the quantity so deferred 1969-1970. The "stretch-out" program was the last of the major policy changes made in the AEC procurement program.

The price to be paid for the deferred material in 1967 and 1968 would be \$8 per pound, the same as the 1962-1966 contracts. The price to be paid in 1969 and 1970 for concentrate produced from properties controlled by the milling company would be calculated

with a formula based on costs during the 1963-1968 period, not to exceed \$6.70 per pound. The price for all concentrates produced from ores purchased from independent producers would be \$6.70 per pound of contained U_3O_8 . On December 10, 1964, Atlas Minerals Division of the Atlas Corp. signed a stretch-out contract to defer the delivery of approximately 3.2 million pounds U_3O_8 . The AEC procurement program ended at midnight December 31, 1970.

URANIUM ORE PROCUREMENT

With AEC contracts to produce uranium, both VCA and USV reopened their inactive vanadium mines in southeastern Utah in 1948. The AEC ore-buying station at Monticello provided a market for independent operators in southeastern Utah and adjacent parts of Colorado, New Mexico, and Arizona. In 1948, some 88,591 pounds U_3O_8 in ore was produced in Utah.

In 1949 and in the early 1950s, exploration in the previous vanadium-producing areas located additional deposits. The AEC established ore-buying stations in White Canyon and at Moab.

USV, which would become Union Carbide Nuclear Corp. in the mid-1950s, established an ore-buying station at Thompson for high vanadium-bearing ores to be shipped by the railroad to its mill at Rifle, Colorado.

Wildcat drilling by Charles A. Steen in July 1952 discovered a large, high-grade deposit in the basal Chinle Formation on the southwest flank of the Lisbon Valley anticline in San Juan County (Figure 1). This

discovery, and the exploration that followed, was so successful that it became Utah's largest uranium producing area. Production from Lisbon Valley in the mid and late 1950s dwarfed all other areas in the state.

Vitro Corp. of American established a railroad facility at Green River to ship ore to an ore-buying station and its processing mill near Salt Lake City. This facility received considerable ore from Lisbon Valley and other districts in southeastern Utah.

By 1954, ore production had increased to 2,293 pounds U_3O_8 in ore, and continued to increase to an all time annual record of 8,629,770 pounds in 1959. Some 74 percent of this uranium came from Lisbon Valley.

Due to uncertainties of the AEC's uranium procurement program, ore production began to decline in 1960 and continued to decline until the program ended at midnight December 31, 1970. When it ended, the four counties in southeastern Utah had produced 11,916,463 tons of ore containing 77,140,685 pounds U_3O_8 and averaging 0.32 percent U_3O_8 (Table 1). This represented 18 percent of the uranium produced under the AEC program. During the period 1966-1970, an additional 81,647 tons of ore containing 353,826 pounds U_3O_8 and averaging 0.22 percent U_3O_8 were produced for private sales.

URANIUM CONCENTRATE PRODUCTION

The vanadium plant at Monticello was acquired by the AEC from the War Assets Administration on July 28,

1948. A contract was signed with the Galigher Company to renovate and manage the former plant for the recovery of both uranium and vanadium. The plant began operating in December 1949 and the first concentrate was produced in January 1950. On April 1, 1956, National Lead Company assumed operation of the plant and continued to operate it until it closed on January 15, 1960.

The Monticello plant was the only AEC-owned ore processing operation in the west and served the useful purposes of (1) stimulating uranium ore production in the area, (2) providing processing cost data for AEC use in contract negotiation, and (3) providing personnel and facilities to test ore processing modifications, health and safety practices, and environmental measures.

In May 1949, VCA signed a contact with the AEC to produce uranium concentrates from a pilot plant mill to be constructed at Hite, at the mouth of White Canyon. The plant was designed to treat the copper-uranium ores from the Chinle Formation of that area. It began operating in August 1949 and closed in December 1953, after producing 128,145 pounds U_3O_8 (Table 2).

Because of the large discoveries at Lisbon Valley, Uranium Reduction Company (URECO) signed a contract in March 1955 to produce concentrates from a mill to be built at Moab, which began operating in October 1956. On August 1, 1962, URECO was merged into the Atlas Corporation and Atlas Minerals Division became the operator. The mill continued to operate after the AEC program was completed.

The final mill to be built in Utah, under the AEC program, was constructed at Mexican Hat on the Navajo Indian Reservation. A contract was signed with Texas Zinc Minerals Corp. on July 17, 1956 and the mill began operating in November 1957. On July 31, 1963, Atlas Corporation acquired Texas Zinc Minerals. Atlas operated the mill through its subsidiary A-Z Minerals until the mill closed in February 1965. The former AEC contract was incorporated into the Atlas contract at Moab.

The price per pound U_3O_8 that the AEC paid for uranium concentrate was negotiated independently with each milling company. Factors considered included Circular 5 Revised prices for ore, types of ore, processing type, haulage distances, and others. At Monticello, contractors were paid for operation costs, plus negotiated fixed fees for their management.

On November 29, 1957, Continental Uranium, Inc. signed a contract with the AEC to produce uranium concentrates from a mill to be built at La Sal. The mill was never built and the contract was cancelled.¹²

Between March 1958, and February 1961, Union Carbide Nuclear Corp. operated an ore concentrator plant at Green River. The plant had a capacity to upgrade 400 tons of ore per day, and the concentrates were shipped by rail to Union Carbide's mill at Rifle, Colorado for further processing.

During the period 1949 through 1970, the AEC purchased 54,595,981 pounds of U_3O_8 in concentrate from mills in southeastern Utah. Total cost to the AEC was \$461,784,642

(Table 2). During 1966 through 1970, Atlas Minerals produced 3,420,460 pounds U_3O_8 for sale to electric utilities.⁶ In addition to the uranium, the Monticello and Moab plants recovered 2,341,869 and 1,254,611 pounds of V_2O_5 respectively.⁶

POST AEC PRODUCTION The Private Market The Beginning and the Boom 1971-1982

Beginning in 1971, all uranium concentrate produced in the United States was destined for use in nuclear power plants for the generation of electricity. It was an open competitive market, and at the beginning of 1971, the spot market price for uranium concentrate was \$6.20 per pound of U_3O_8 .

As the demand for nuclear fuel increased the prices continued to rise in the 1970s, and by August 1976 the price was over \$40 per pound U_3O_8 in concentrate.

Rio Algom Corporation began producing uranium concentrate from its Lisbon mill, in Lisbon Valley in November 1972 for sale to Duke Power Co. Only ore from the company's Lisbon mine would be processed. These orebodies were located in 1962-1964 in the Moss Back Member of the Chinle Formation, on the down-dropped side of the Lisbon Valley fault at an average depth of 2,500 feet.

Increased prices allowed mine operators to mine lower grade material for sale on the spot market. Exploration also expanded and new discoveries were made in Lisbon Valley and

in the Henry Mountains. With new mines starting in the La Sal area and increased production from the Velvet mine in south Lisbon Valley, ore production was peaked in the post-AEC period of 4 million pounds U_3O_8 in 1980.

Also in 1980, Energy Fuels Nuclear completed its White Mesa mill near Blanding. This 2,000 tons per day plant began operating in May. The ore feed came from company mines in the Grand Canyon region of Arizona, southwestern Colorado, and southeastern Utah. Some custom ore from independent operators was also processed. Plateau Resources' 750 ton per day mill at Ticaboo, in Garfield County, was completed in 1980 and ore from the nearby Tony M mine in the Salt Wash Member was stockpiled.

During 1980, the spot market price for uranium dropped from \$40 to \$27 per pound U_3O_8 in concentrate. The price drop was largely due to over-production and the general non-acceptance of nuclear power as an energy source. Long-term contracts allowed the mills to continue production.

In 1982, Atlas closed its mines near Green River and some on the Sage Plain and reduced production at others. Plateau Resources operated its Ticaboo mill for only a few months during 1982, and processed some 43,000 tons of low grade (less than 0.10% U_3O_8) ore from the Tony M stockpile. Both the mine and mill were placed on standby.

The Declining Market, 1983 to 1990

At the beginning of 1983, the spot market price for uranium was \$20.25 per pound U_3O_8 . Energy Fuels Nuclear put its White Mesa mill on standby in February 1983 and allowed the ore stockpiles to build up. Umetco Minerals Corporation, a recently formed wholly owned subsidiary of Union Carbide Corp., acquired a 70% interest in the plant in January 1984. During 1983, Rio Algom began custom and/or toll milling at its Lisbon mill. This provided a market for independent operators in the Lisbon Valley and in the Moab areas.

Due to continued low prices, Atlas Minerals closed all of its remaining mines, as well as its Moab mill in March 1984. Only Rio Algom's Lisbon mill continued to operate in the state. Ore production dropped to about 1.5 million pounds U_3O_8 in 1984.

The White Mesa mill reopened in October 1985 and began processing stockpiled ore that had accumulated while the mill was on standby. Since Umetco Minerals closed its Uravan mill in November 1984, White Mesa was now the only mill on the Colorado Plateau to recover vanadium. The White Mesa mill processed Energy Fuel's ore from its mines in the Grand Canyon region of Arizona for a few months and then switched to the uranium-vanadium ore from Umetco's and independent mines in the Uravan mineral belt.

In December 1987, the White Mesa mill was once again put on standby while the ore stockpiles built up. It reopened in July 1988. Prices for

vanadium increased in 1988 and vanadium became more important than uranium in the ores of the Salt Wash Member of the Morrison Formation. In October 1988, Umetco acquired 13,600 acres of uranium properties in the Uravan mineral belt from Atlas Corp., and reopened many inactive mines. In Utah, this included mines in the La Sal, Dry Valley, and Sage Plain areas (Figure 1).

Due to a depressed uranium market, Rio Algom closed its Lisbon mine and mill in October 1988. The Lisbon mine, since 1972, had produced over 13 million pounds U_3O_8 . The spot market price at the end of 1988 was down to \$11.75 per pound U_3O_8 .

During 1989, White Mesa mill at Blanding was the only operating mill in Utah, since Rio Algom closed the Lisbon mill. During the year, Umetco announced it would produce some 10 million pounds V_2O_5 and 2 million pounds U_3O_8 at White Mesa from mines in Colorado and Utah. Utah's share of the amount would be approximately 40% or 800,000 pounds U_3O_8 . At the end of 1989, uranium on the spot market was only \$9.00 per pound U_3O_8 . In 1990, the mill went on standby and there was no longer a market for ore in southeastern Utah.

PRESENT STATUS

The millsites at Mexican Hat and Monticello have been reclaimed by the DOE and the tailings placed in nearby disposal cells. The millsite and tailings at Hite are now under the waters of Lake Powell. Currently, DOE is planning to move the tailings at Moab, via

rail, to a disposal cell near Crescent Junction, Utah. Both the mills at Blanding and Ticaboo are still licensed by the Nuclear Regulatory Commission and there are reports they may soon operate again.

The spot market price for uranium concentrate has been increasing rapidly in recent years. Currently (January 1, 2006), it is \$36.50 per pound U_3O_8 . This increase has been responsible for many new claims being staked in southeastern Utah. The *Denver Post* reported on July 24, 2005, the following new claims have been recorded in southeastern Utah since January 1, 2005: San Juan County 3,851, Emery 1,078, Grand 745 and Garfield County 489. It appears the next uranium boom is underway and mines and mills may soon reopen.



Bill Chenoweth is a Registered Professional Geologist living in Grand Junction, CO. In 1953 he joined the staff of the Grand Junction office of the U.S. Atomic Energy Commission. For the next 30 years he spent studying and evaluating uranium deposits on the Colorado Plateau and in Wyoming and South Dakota for the AEC and succeeding agencies, the Energy Research and Development Administration and the Department of Energy. Since retiring from the Federal service, he has consulted for various State and Federal agencies, as well as mining and engineering firms.

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And so the ore trucks rumbled on towards Moab and the future. (Steen Collection)

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