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Mining the Colorado Plateau: the Story of Calamity Mesa 1910-1970

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MINING THE COLORADO PLATEAU:

THE STORY OF CALAMITY MESA

1910-1970

by

Lisa Pitcher Godfrey

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This thesis is dedicated to Ethel Poage and the many others who lived and worked on Calamity Mesa and lived to tell me about it.

ACKNOWLEDGEMENTS

I am grateful to many members of the history faculty at Utah State University for providing me with an excellent education and valuable insights and advice. Specifically, I am deeply grateful to Dr. F. Ross Peterson for his constant support and assistance. Without him and his caring wife, Kay, this project would have never been completed.

The help of many people has been invaluable. I would like to thank Carolyn Fullmer and Marci Hatfield for transcribing many oral interviews, R. Brent Colledge for making maps under pressure, Judy Prosser-Armstrong for her help while I was in Grand Junction, and Bill Tennant for providing me with a place to work while I was there. Thanks must also go to Michael Piontkowski of the Bureau of Land Management for his persistence in getting this project funded and his amazing driving skills which got us to and from Calamity Mesa.

I am forever grateful to Julie B. Pitcher, my mother, for her constant support and encouragement, and many other friends and family who have supported me through it all. Finally, to my husband, L.J., I will never be able to fully thank him for his constant patience, faith, and support.

Lisa Pitcher Godfrey

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GLOSSARY

ATOMIC ENERGY COMMISSION (AEC) -- Set up by the Atomic Energy Act of 1946. The civilian commission took over the Manhattan Engineer District by Executive Order 9816 and oversaw the production and acquisition of raw materials critical to atomic weapon development, as well as the production of those atomic weapons.

CARNOTITE -- A mineral ore located in the Salt Wash Member of the Morrison Formation throughout the Uravan Mineral Belt on the Colorado Plateau.

CLIMAX URANIUM COMPANY -- A division of American Metal-Climax, which began operating in the Colorado Plateau in the 1950s. Climax became the chief presence on both Calamity and Outlaw Mesas, with the Arrowhead Camp on Calamity, and the Climax Camp on Outlaw. Climax built a uranium mill in Grand Junction in the 1950s. This mill and all of Climax's operations in the area closed in 1970.

MANHATTAN ENGINEER DISTRICT (MED) -- The section of the Army Corps of Engineers which oversaw the Manhattan Project. The Manhattan Project in turn directed the research and development of the atomic bomb.

METALS RESERVE COMPANY -- Established by the United States government in 1942 to further spur the production and acquisition of vanadium and uranium. As the market developed, United States Vanadium Corporation absorbed Metals Reserve Company.

RADIUM -- A highly radioactive metallic element found in carnotite ore. Its decay yields radon gas and alpha rays.

UNION MINES DEVELOPMENT CORPORATION (UMDC) -- Developed under the aegis of Union Carbide by the Manhattan Engineer District. UMDC played a critical role in the exploration and development of carnotite ore bodies throughout the Colorado Plateau area. After UMDC was disbanded, Union Carbide kept copies of its records.

UNITED STATES GEOLOGICAL SURVEY (USGS) -- Cooperated with the MED and the AEC through joint surveying ventures. USGS worked throughout the Colorado Plateau surveying and mapping promising ore bodies.

UNITED STATES VANADIUM CORPORATION (USVC) -- A subsidiary of Union Carbide and Carbon Corporation. After acquiring the assets of Standard Chemical in the 1930s, USVC dominated the vanadium-uranium market from 1940 through 1970. USVC was a key supplier of ore for the federal government throughout this period.

URANIUM -- A white, lustrous, radioactive, metallic element, occurring in pitchblende and carnotite ore. It has compounds that are used in photography and in coloring glass. The 235 isotope is used in atomic and hydrogen bombs and as fuel in nuclear reactors.

VANADIUM -- A rare element occurring in certain minerals, including carnotite. It is used as an ingredient of steel to toughen it and increase its shock resistance.

VANADIUM CORPORATION OF AMERICA (VCA) -- The chief competitor with USVC from 1940-1970. VCA acquired the assets of the Colorado Radium Company and the Radium Luminous Metals Company during the 1930s to establish itself as a major player in the vanadium-uranium market.

ABSTRACT

Mining the Colorado Plateau:

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1910-1970

by

Lisa Pitcher Godfrey, Master of Arts

Utah State University, 1991

Major Professor: Dr. F. Ross Peterson
Department: History

This thesis was written to outline the history of five stone houses, which have survived almost a century of mining activity. The houses are located on a barren mesa, called Calamity, in southwestern Colorado. This work was funded by the Bureau of Land Management, Department of the Interior, in order to explore the possibility of designating this site as a National Historic Site.

Men and women lived and worked on this and the surrounding mesas for most of the twentieth century. The lives of the families, the men, women, and children who lived and worked on Calamity Mesa, provided the context for the entire period. These people formed nebulous communities on what could only be called a twentieth-century frontier.

I used several methods for this study, including oral interviews with surviving miners and their families, company and government officials, mining engineers, and medical personnel involved in studies concerning the effects of radiation exposure. Government publications, local newspapers, and personal papers of several individuals were also researched. Through the use of these methods I further developed the history of the period, by focusing on Calamity Camp and the lives of the men and women who lived and worked there.

The miners who came to Calamity Mesa extracted the carnotite ore from sandstone beds. Originally, miners searched for radium, desired for its illusory cure for cancer. Then they sought vanadium, which was used as a strengthening agent for steel during both world wars. Finally, their goal was uranium, a key component for the production of nuclear weapons and energy.

The search for these minerals brought many working-class men and women to the Colorado Plateau. They brought their families to Calamity Mesa and lived in whatever shelter they could find. The stone houses, lived in by generation after generation of miners and their families, who came searching for carnotite, provided a permanence to Calamity Mesa throughout this period. (107 pages)

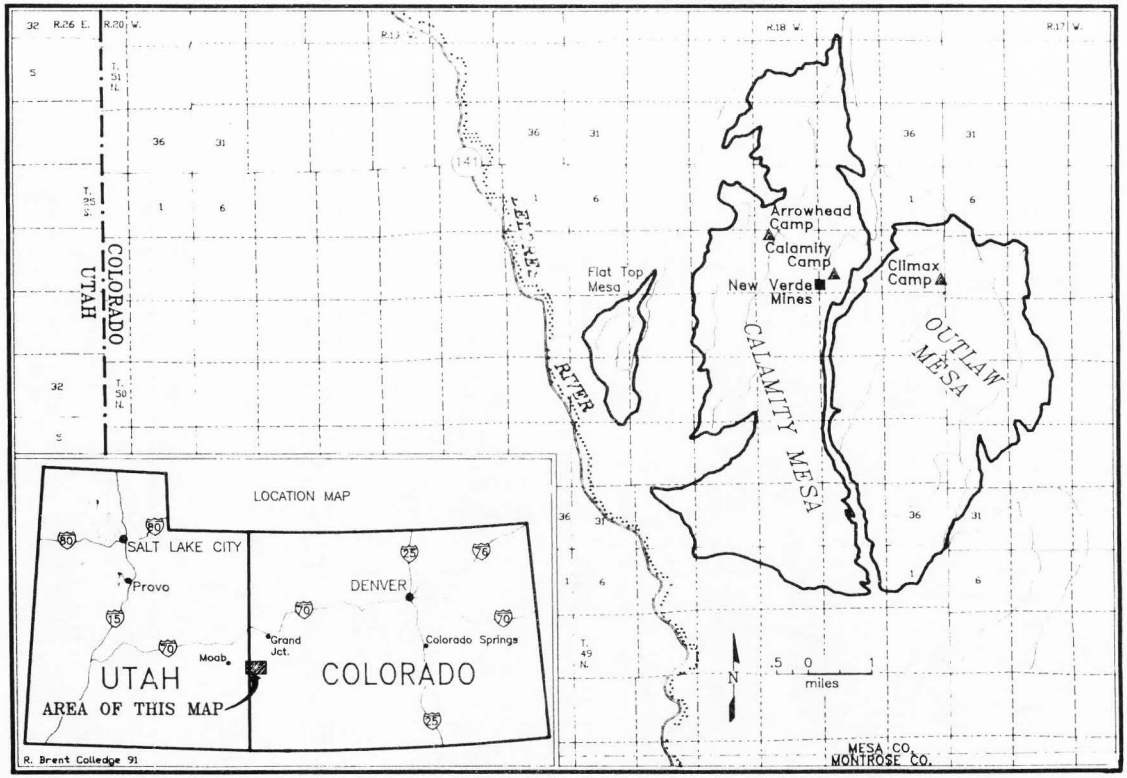

Figure 1. General Location Map.

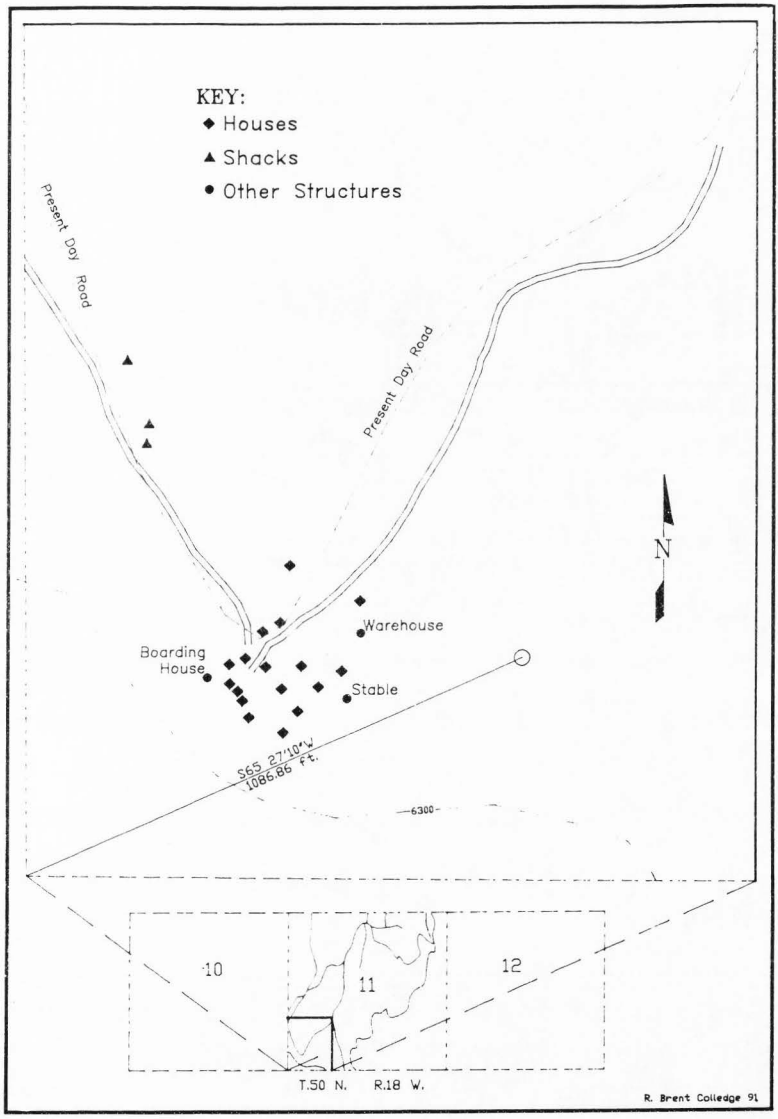

Figure 2. Calamity Camp Circa 1922.

INTRODUCTION

On a barren upthrust in southwestern Colorado called Calamity Mesa stand five empty stone buildings, remnants of almost a century of mining activity. Men and women have lived and worked on this and the surrounding mesas for most of the twentieth century. They first came to Calamity in the early 1900s for jobs that meant bare survival. Some worked only for room and board. Few had dreams of wealth. However, as time and science progressed, the minerals found on this isolated mesa increased in value. And over a period of fifty years there came to be much more than just survival at stake.

Calamity Mesa is located on the northern tip of the Uravan mineral belt (See Figure 1, page x).[1] The mesa itself slopes to the southwest, away from the western side of the Uncompaghre Uplift. The elevation ranges from 7,100

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[1] The Uravan mineral belt was defined by the U.S. Geological Survey in 1952 as an elongated area in southwestern Colorado where uranium-vanadium deposits in the Salt Wash Member of the Morrison Formation "generally have closer spacing, larger size, and higher grade than those in adjacent areas and the region as a whole." William L. Chenoweth, "The Uranium-Vanadium Deposits of the Uravan Mineral Belt and Adjacent Area, Colorado and Utah," in New Mexico Geological Society Guidebook, 32nd Field Conference, Western Slope Colorado, (Grand Junction, 1981), 165. This mineral belt includes the Gateway, Uravan, Bull Canyon, Gypsum Valley, and Slick Rock mining districts, all of which are situated in southwestern Colorado, near the Utah border. Calamity Mesa lies within the boundaries of the Gateway district.

feet at its northern boundary to about 6,000 feet at its southern boundary.

The surface of the mesa is a very hard, resistant Dakota sandstone, which forms a cap over the softer shales of what geologists describe as the Brushy Basin member of the Morrison formation. This shale creates steep slopes which gradually flatten toward contact with the Salt Wash sandstone member.[2] The Salt Wash, also part of the Morrison formation, contains economic deposits of carnotite ore throughout western Colorado, southeastern Utah, northeastern Arizona, and northwestern New Mexico.[3]

The miners who came to Calamity Mesa extracted the carnotite ore from these sandstone beds. Composed of approximately fifty-nine percent uranium oxide and twenty percent vanadium oxide, carnotite included minerals which increased in importance throughout the twentieth century.[4] Originally, miners searched for radium, desired for its illusory cure for cancer. Then they sought vanadium, which was used as a strengthening agent for steel during both

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[2] Ervin E. Waulters, "Diamond Drill Exploration for Uranium-Vanadium Deposits in the Morrison Formation, Salt Wash Member, Calamity Mesa, Colorado" Raw Materials Operations Report 656 (New York: United States Atomic Energy Commission, 1951), 3.

[3] Chenoweth, 165.

[4] R.C. Coffin, "Radium, Uranium, and Vanadium Deposits of Southwestern Colorado," Colorado Geological Survey Bulletin 16 (Denver, 1921), 168.

world wars. Finally, their goal was uranium, a key component for the production of nuclear weapons and energy.

The search for these minerals brought many working-class men and women to the Colorado Plateau. They brought their families and their possessions to Calamity Mesa and lived in whatever shelter they could find. The stone houses came first. Built between 1920 and 1922, some remained standing into the 1990s. The stone houses, lived in by generation after generation of miners and their families, who came searching for carnotite, provided a permanence to Calamity Mesa through boom and bust (See Figure 2, page xi).[5]

The landscape of Calamity Mesa remained constant during this time. The semi-arid climate meant that few trees and little water defined the day-to-day lives of the people living there. The lack of water and timber made the miners' job even more difficult. Except for a random flower in the springtime, cedar, pinon, sagebrush, and an occasional cactus provided a monochromatic picture on the mesa itself. Summers were hot and dry and long periods without rainfall occurred every year. The natural water springs, which ran

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[5] Trailers, tar-paper shacks, tents and jeeps served as homes through the boom periods and then were moved down off the mesa during the bust periods.

down either side of the mesa, diminished as the run-off from the Uncompaghre Uplift dried out.[6]

Winter often brought two feet of snow, more in higher elevations, and day-time temperatures often fell below zero. But winter brought more than just snow and cold temperatures. Calamity Mesa, accessible only by steep winding mountain roads, became totally isolated in wintertime. This isolation served as another constant in the lives of those who lived and worked there: under the best of conditions, the trip to Calamity Mesa from the nearest population center was a long and harrowing one.

The history of the stone houses which survive provided the impetus for this thesis: among other things, I wanted to know who lived there, what companies were involved, how often the houses were inhabited, and the prosperity of the mining efforts that went on there. Through a joint-project between the Mountain West Center for Regional Studies, the Museum of Western Colorado and the Bureau of Land Management, funding was provided that enabled me to spend the summer of 1990 in Grand Junction doing research and, more importantly, interviewing those who survived the

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[6] Waulters, 4. See also Coffin, 16: "The numerous streams suggest that the area is well watered for at least part of the year. This impression, unless properly qualified,is misleading. The streams are represented as permanent or intermittent. As most of the intermittent streams carry water less than two months of the year or during infrequent showers, their channels might better be termed dry water courses."

uranium boom and are still living to tell about it.[7] These people are central to the story, because the lives of the families, the men, women, and children, who lived and worked on Calamity provide the context for the entire period.

These people formed near-communities on what could only be called a twentieth century frontier. Their children went to school in tar-paper shacks and quonset huts. The men came together in the evenings after long days in the uranium mines to play cards and swap tales. The women had gatherings where quilting and sewing provided the backdrop for hours of talking about the mines and living conditions. They helped each other through difficult times, through boom and bust in a dangerous environment. Always lying barely underneath the surface of their daily work, especially during the 1950s and 1960s, was the constant worry about the toll the work in and around the mines was taking on their health.

We must understand the work they did with its many risks, both immediate and throughout time; the games they played to forget the risks and to come together with friends and family; and their communities, which they formed in isolation from the rest of the world. Only then will the story behind the stone houses emerge.

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[7] These interviews and their transcripts will be housed by the Museum of Western Colorado and the Grand Junction Public Library.

CHAPTER I

SEARCHING FOR HIGH GRADE

1910-1940

The beginning of the twentieth century found Calamity Mesa isolated and barren, covered with pinon pine and cactus, providing a home for deer, mountain lions, and rattlesnakes. There was little indication that the next century would bring one of the biggest mining rushes in the history of the American West. The desert conditions of the Colorado Plateau caused extreme difficulties for the men and women who lived and worked there. The shortage of water, scarcity of trees for lumber and fuel, and the difficult terrain for transportation increased the risk involved in an already hazardous business.

The ore these men and women mined was also chemically complicated, leaving them at risk if they shipped ore that was not a high enough grade to merit the journey.[8] The men and women who came to Calamity Mesa in the early 1900s were searching for carnotite ore, a bright yellow mineral that had concentrated in petrified trees and in veins running underneath the sandstone. The ore had been there for millions of years, and remained just underneath the surface

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[8] Patricia Nelson Limerick, Desert Passages: Encounters with American Deserts, (Albuquerque: University of New Mexico Press, 1985), 21.

of the sandstone for the miners to find in "a kind of cosmic treasure hunt."[9]

The years from 1900 to 1935 marked the onset of the first vanadium-uranium rush. This rush was rather limited in scope, as the isolated nature of the mines and the difficult transportation lines kept mining companies from accepting and shipping anything but the highest grade carnotite. Only this high-grade ore brought the kind of profit necessary to maintain operations on the Colorado Plateau.

The federal government left carnotite mining in the West largely unrestricted throughout this first rush period. Few uses for vanadium and uranium had been discovered, and none of those uses posed any perceived, regulation-requiring threat to the national welfare. The only federal regulation that affected the miners on Calamity during this period was a law that influenced all hard-rock miners throughout the West.

State and federal governments controlled hard-rock mining, including gold, silver, and copper mining, in a very limited manner throughout the twentieth century. The key mining law, passed in 1872, remained on the books and viable without amendment for more than a century. It is in fact the only remaining land-disposal law still in use from the

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[9] Ibid., 20.

nineteenth century.[10] This law affected the miners on Calamity, as well as all miners on the Colorado Plateau, as it determined how these men and women staked their claims, explored for uranium and vanadium, and ultimately patented or received title to the land their claims fell on.

The 1872 mining law, "An Act to Promote the Development of the Mining Resources of the United States," established the premise that miners should glean the profits of discovery, while the nation as a whole would benefit from private exploration and development of minerals on public lands. While the government's interpretation of this varied with the eventual federal control of the uranium industry, this law remained unchanged for over a century.

The specifics of the law, however, are what structured the daily work of the miners. The size of the claim, the minimum amount of work to be done, and the methods for making that claim private property were all outlined in the law. Section two determined that the length of the claim should be no more than 1,500 feet, while the width should be no more than 300 feet on each side of the middle of the vein at the surface. Section three gave the locators or miners of all mining locations on any vein, lode, or ledge, the

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[10] "A Tenacious Law May Lose Its Grip," High Country News, 4 June 1990.

"exclusive right of possession and enjoyment of all the surface included within the lines of their locations."[11]

When miners dug inclines to find ore, section four of the law allowed the owners of such tunnels the right of possession of all veins or lodes within 3,000 feet from the face of the tunnel. However, failure to work on any tunnel for six months mandated an abandonment of the right to all undiscovered veins on the line of that tunnel.

Section five of this law allowed the miners of each mining district some control of the rules and regulations governing their district, as long as these rules were not in conflict with federal, state, or territorial laws governing the location. However, some requirements were laid out for all locations. The location of the claim had to be distinctly marked on the ground. The records of the mining claim had to contain the name or names of the miners, date of location, and a description of the claim located, by reference to some natural object to identify the claim; and at least $100 worth of labor or improvements had to be made every year on each claim. Failure to comply with these conditions meant that the claim would be open to discovery as if no discovery had ever been made.[12]

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[11] U.S. Department of Labor, Major Federal Mining and Mineral Laws, prepared for the Mine Safety and Health Administration by W.F. Wiant (Washington, D.C.: Government Printing Office, 1985), 9-10.

[12] Ibid., 10-11.

The government, through this law, instituted certain policies unique to mining. Miners had open access to all public lands not specifically withdrawn from mining. Mining companies and miners had the right to explore and develop minerals on public lands without having to notify federal officials or buy permits, and these groups and individuals had a vested property right for the span of mining.[13] This law also allowed men and women to use the property they had claimed with the county to build a house, cut timber, and graze cattle, as long as the uses were incident to mining. The 1872 law contained no environmental restrictions.

After having claimed and located a piece of land and complied with the terms of the act, the locators filed for a patent in the proper land office. If after sixty days no one contested the patent, the claimant filed a certificate with the U.S. Surveyor-General that $500 worth of labor had been expended or improvements made, that the plat was correct, and that the descriptions identified the claim. At that point the government assumed that the applicant was entitled to a patent after the payment of $5 an acre. Thus miners obtained title to the surface and mineral rights on public land.[14]

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[13] "A Primer on the Mining Law," High Country News, 4 June 1990.

[14] Ibid., 11-12.

Twenty years after the mining law of 1872 was passed, prospectors from Ouray and Telluride headed north from the mountainous terrain of southern Colorado, to look for silver and gold in the mesas. These men and women found petrified trees saturated with a bright yellow unknown mineral, while scientists in Europe were discovering uses for that mineral. The brightly colored carnotite contained radium; vanadium, which had achieved only limited use as a steel strengthener in the years before World War I; and uranium, the potential use of which was undetermined. In 1896, Antoine Henri Becquerel discovered the invisible rays that emanated from uranium ore when he noticed that uranium salts affected a photographic plate. This provided the catalyst for further research, which uncovered the existence of radioactive elements and the nature of radioactivity.[15]

Further research by Pierre and Marie Curie in Paris led to the discovery of radium and its usefulness as a treatment for cancer in 1898. As this medical use of radium increased in popularity, the demand for this mineral expanded dramatically in the decade following its discovery. Active exploitation of carnotite, (the ore that contained uranium

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[15] Gary Shumway, "A History of the Uranium Industry on the Colorado Plateau," (Ph.D. diss., University of Southern California, 1970), 4. Information about these events can also be found in the United States Atomic Energy Commission "Uranium Exploration on the Colorado Plateau Interim Staff Report" Raw Materials Operations Report No. 1000. (Grand Junction, Colorado: Colorado Exploration Branch, 1951). Chenoweth, "The Uranium-Vanadium Deposits of the Uravan Mineral Belt,"; and Coffin.

and its derivative, radium) began in the spring of 1898.[16] By the end of 1911, the European scientific community's interest in radium provided a limited market for high grade carnotite. The medical community in the United States also provided an outlet.[17]

This expanding market, however, soon experienced limitations with the onset of the First World War. The war terminated the European market, as research facilities shut down. Demand in the United States continued for a time, but the depression of 1921 limited both the vanadium and radium markets even further. The announcement in 1921 of the discovery of high-grade pitchblende deposits in the Belgian Congo, which ran as high as 80% uranium, devastated domestic mining as the Belgian Congo completely took over the market and forced the closure of most of the Colorado Plateau mines.[18]

Three domestic companies controlled most of the vanadium-uranium mining between 1910 and 1928. Standard Chemical Corporation, the Radium Company of Colorado, and the United States Radium Corporation furnished almost all of the world's supply of vanadium and radium. However, the suddenness of the loss of the vanadium and radium markets

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[16] "Uranium Exploration," 5.

[17] Shumway, 11.

[18] Ibid., 74.

left the domestic carnotite industry prostrate.[19] Thus, the ensuing decade was almost void of large company exploitation of the carnotite deposits on the plateau.[20]

Calamity Camp became active during this first boom period. A land survey compiled by Leonard Cutshaw in 1902 found nothing but a few Indian trails on Calamity Mesa, while elsewhere in the region, prospecting activity appeared to have taken place.[21] However, by 1922, a mineral survey made by F.C. Armstrong outlined the location of the stone houses in Calamity Camp and determined their use, as well as enumerating many other structures that were more transitory in nature.[22] The twenty years between these two surveys was a time of activity for the camp, as claims were discovered by individuals such as Peg Leg Foster and A.H. Ward, then sold to mining companies as the market declined.[23]

Government reports maintain that many of the claims of the Calamity District--including Blue Creek, Outlaw, and Tenderfoot Mesa, all surrounding Calamity Mesa--were located

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[19] Ibid., 78.

[20] Ibid., 79.

[21] Leonard Cutshaw, "General Land Office Survey: Township 50 N. Range 18 W. New Mexico Principal Meridan," (Grand Junction: Surveyors General Office, 1903). "Uranium Exploration," 6.

[22] F.C. Armstrong, "Minerals Survey 20177 Report and Map," (Grand Junction, 1922).

[23] Robert and Marjorie Foster, interview with author, Grand Junction, Colorado, 6 August 1990.

by several prospectors in 1910.[24] A.H. Ward located the Calamity Creek claims in February, 1913. Calamity Creek No. 1 and No. 4 were the initial claims recorded in the Mesa county courthouse. By November of 1913, Henry Reams joined Ward as one of the locators. From November 1913 to March 1916, Ward and Reams filed yearly improvements on most of the Calamity claims in accordance with the law of 1872.[25] Peg Leg Foster and his brothers discovered rich carnotite claims on neighboring Outlaw Mesa during this period.[26] The Grand Junction Daily News reported the sale of carnotite claims in the Unaweep Canyon, which leads to Gateway and lies below Calamity Mesa. The paper predicted heavy claim development and that "Gateway should double in population in a short while."[27]

Government reports indicated that George Pickett leased and operated some of the mining claims on Calamity Mesa during 1915 and 1916 and perhaps for the next four years, but his name did not appear on the claim records. Therefore, he may have worked for the Carnotite Reduction Company, at least part of that time, as their name was listed on the county records. During these same years O.W.

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[24] "Uranium Exploration," 9.

[25] "Lodes and Placers Index: 1900-1938," index located at the Mesa County Courthouse in Grand Junction, Colorado.

[26] Robert and Marjorie Foster, interview with author.

[27] Grand Junction Daily News, 7 April 1914.

Courtney located and worked the Dixie claims which are located on the southwestern tip of the mesa.[28] The stone buildings later stood on this claim group.[29]

The Tungsten Products Company filed an amended location certificate for the Calamity No. 1 claim in Mesa County on August 29, 1920. This certificate stated that this lode was first located in February of 1913, in the same area as the Calamity Creek No. 1 claim, filed by A.H. Ward. Thus as time passed, the Calamity Mesa claims came to be known primarily by their numbers, (e.g. Calamity No. 1, 2, 3, etc.) with a few exceptions such as the Dixie claims.[30] The Tungsten Products Company advertised in the Grand Junction Daily Sentinel for carnotite miners. The company needed these miners for the Gateway mining district, which included the Calamity mines. The advertised rate of pay was $1.00 a day, plus board.[31]

The next fifteen years saw the claims on Calamity Mesa passed from company to company. Mining companies such as

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[28] "Lodes and Placers Index." See also "Uranium Exploration," 9, and Waulters, 6.

[29] One of the oldest cabins remaining on Calamity Mesa, up the road from Calamity Camp proper, has been identified as the Courtney cabin by residents of Gateway. Thus O.W. Courtney apparently built his cabin away from some of the actual claims he was working.

[30] "Additional and Amended Location Certificate," filed at the Mesa County Courthouse, Grand Junction, Colorado, 29 August 1920.

[31] Grand Junction Daily Sentinel, 18 September 1920.

the Tungsten Products Company, the Radium Company of Colorado, the Atlas Corporation, the International Vanadium Corporation, and the Molybdenum Company of America developed the principal claims throughout the period.[32] Several sources placed the ownership of the claims with the Radium Company of Colorado by 1920.[33] This company purchased the claims, as newspapers reported declining prices for carnotite ore due to a dropping market for vanadium.[34]

The Radium Company of Colorado worked the Calamity mines between 1920 and 1922. It was during this period that the stone houses appeared on Calamity Mesa. Only a company with available capital could have had the resources to build this size of camp with such permanent structures. The individuals who had been working the claims during earlier phases did not have this kind of capital available to them. The mineral survey by F.C. Armstrong in 1922 showed five stone houses, one stone stable, a stone cellar, a stone warehouse, and a stone storehouse.

The number of stone structures suggested a considerable investment of time, labor and money in the Calamity Camp. In addition to the permanent stone structures, Armstrong listed eleven tent houses and a log and frame boarding house. This camp was obviously home for a group of workers,

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[32] "Uranium Exploration," 9.

[33] "Uranium Exploration," 10. See also Waulters, 7.

[34] Grand Junction Daily Sentinel, 1 January 1921.

employed by the Radium Company of Colorado. Additional improvements, such as a reservoir for water and three springs, meant that a group of people maintained a semblance of a community on Calamity Mesa. Records indicate that this community lasted two to three years at the most.[35]

In August of 1922, James S. James filed an affidavit of labor and improvements on the Calamity claims as the law of 1872 required. He may have done so for the Radium Company of Colorado, or he may have acquired the title for the claims from this company, thus illustrating the disbanding of the Radium Company community. The following summer in June, J.E. Weston filed an affidavit of labor and improvements on the same claims for the National Radium Products Company.[36]

Little can be discerned about this community, except that there were no roads to Calamity Camp at this time. All supplies going to the camp and all ore coming out had to be transported by mule train. The camp existed in a state of total isolation, except for the packer with his string of mules. At this time the local newspapers were filled with news of labor unrest in the neighboring coal mines, as "A

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[35] Armstrong.

[36] "Lodes and Placers Index." The actual owner of the claim was sometimes unclear from the affidavits filed. However, usually the index named the owner, if the name was different from the leaser, who was responsible for filing the affidavit of labor and improvement.

Mighty Battle Between Capital and Labor Looms."[37] But the unrest did not reach the isolated mesas, as the miners remained far removed from organizing forces. For many carnotite miners in these years and the years to follow, the fact that the companies would provide board with the small wage they earned was enough to keep them from striking out against the companies. In a time of depression, the small town of Gateway and the other towns in the area provided few options for the men and women who lived there.

In 1924, the Atlas Corporation bought the Calamity properties and leased them to Jake Lewis, a member of a prominent family in Gateway, Colorado. Lewis employed forty to fifty men at Calamity and the surrounding mesas. This group mined a considerable amount of high-grade ore according to government documents.[38] The Radium Luminous Metals Company of East Orange, New Jersey, purchased the high-grade ore mined by Lewis and his workers, the majority of which came from petrified trees. Lewis and his crew also lived in the stone houses, with his mother serving as cook. In the beginning they packed all their supplies in with mules, in long pack trains of thirty to forty mules per string. The Atlas Corporation built the first wagon road from Gateway into the Calamity Mining District in 1925, ending the necessity of packing all supplies. At the bottom

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[37] Grand Junction Daily News, 30 October 1919.

[38] "Uranium Exploration," 10, and Waulters, 7.

of the road stood a two-story building that served as a hotel and boarding house for mine owners, packers, and miners.[39]

Jake Lewis purchased many of his supplies from local ranchers in the Unaweep Canyon. He bought hay, beef, pork and lard and had a good reputation for taking care of his workers. However, accidents occurred and men got sick. One man died of pneumonia, upsetting the miners and the few women who lived on the mesa. Lewis reportedly came to get the body, wrapped it in a blanket, and sat the dead man in the seat next to him in his 1920s roadster. He then drove the body to the undertaker in Grand Junction.[40]

The discovery of high-grade ore in the Belgian Congo ended the boom period of the 1910s and early 1920s. For the next ten years the Calamity claims passed through the hands of various individuals and companies trying to make a profit in a difficult market. After Jake Lewis abandoned the claims, H.A. McQuarrie filed improvements in June of 1927. Then after only one year, the Vanadium Alloys Corporation acquired most of the claims.[41] This corporation held the claims until 1933, but nothing indicated how much, if any

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[39] Walter Casto, interview with author, Grand Junction, Colorado, 6 August 1990.

[40] Ibid. This story has moved into the realm of folklore and it is impossible to tell how much of the tale is factual.

[41] "Lodes and Placers Index."

activity went on at the camp itself. E.F. Sutherland filed the affidavit of labor and improvements in 1930, thus at least one person remained on the mesa working the claims. By 1934 the Calamity claims changed hands again. This time the Molybdenum Corporation of America purchased the titles. The Molybdenum Corporation held these titles until 1938, with Julius Foster acting as their agent on the mesa.[42] Richard Fischer also spent time on Calamity Mesa and throughout the surrounding mesas in 1933. However, he was there for a different purpose. Fischer passed the year doing graduate work, studying the carnotite deposits and figuring out their geological makeup. He spent the rest of his career working for the U.S. Geological Survey, helping the government determine the location of uranium deposits necessary for classified military projects.[43]

Just prior to World War II in Europe, the demand for vanadium, a valued war-time commodity for its steel-strengthening qualities, went up enough to reactivate many of the uranium-vanadium mines on the Colorado Plateau. In 1938 the Calamity Camp saw activity again with this new boom. A group of miners, working for G.J. Smith of Grand Junction, moved onto the mesa into the stone buildings. Howard Balsley, supposedly the purchaser of the ore, filed

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[42] Ibid.

[43] Richard Fischer, interview with author, Grand Junction, Colorado, 10 July 1990.

the proof of labor.[44] The group moved up in November, before snow fell, and spent the entire winter isolated from the communities below.[45]

Ethel Poage took her five-year-old daughter and went to Calamity Camp on horseback that November to cook for the miners. G.J. Smith paid for the boarding of her two older children, as they stayed in Gateway to attend school.[46] The road, built by the Atlas Corporation, became impassable after one inch of snow had fallen. Walter Casto packed all the supplies up on burros near Blue Creek, a ranch located several miles south of Gateway.

Four men went up to mine for Mr. Smith that winter: Mark Engebretson, Alfred Engebretson, Ed McKinley, and Walter Casto. The men bunked in one of the stone houses in Calamity Camp. Ethel and her daughter, Norma, took the largest cabin, which served as the cookhouse. When they arrived, the group found Mr. and Mrs. Thurber, a mining engineer and his wife, occupying one of the cabins and their son assaying ore in the laboratory he built in another.

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[44] "Index to Lodes and Placers: 1939-1952," index located at the Mesa County Courthouse, Grand Junction, Colorado.

[45] The following information was taken from oral interviews with Ethel Poage, Louise Warren, and Walter Casto of Gateway, Colorado. Interviews were conducted 9 August 1990 and 6 August 1990, respectively.

[46] The children stayed at the residence of Roy Vaughn of Gateway, Colorado.

Ethel cooked two hot meals a day for the miners and packed each of them a lunch to take with them to the mine. The actual mine they worked, the Hidden Treasure, was located a mile and a half from the camp. She fixed lots of "buckskin and beans" on a wood and coal stove (with wood she hauled herself); a meal that was repeated dozens of times that winter.[47] She hauled water for the camp from the bottom of the canyon, melting snow for drinking water and washing during the winter months. Spring weather meant that Ethel took the washing and her tubs and washboard down to the spring, and built a campfire there in order to wash out both hers and the miners' clothing.[48]

Walter Casto spent his days packing supplies up to Calamity Mesa from Blue Creek and ore back down, to be loaded on trucks and stored in Grand Junction. Hay had to be packed up every night to feed the burros, which stayed in the stone stable in the camp. Walter often packed supplies on Sunday, as the truck delivered those supplies, some perishable, regularly on Tuesday and Saturday.

Isolation weighed heavily on the men and women living in Calamity Camp that winter. Mrs. Thurber, sick with

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[47] A game warden visited the camp in the spring of 1939 and sat down to a dinner of venison roast. Although the deer had obviously been poached out of season, the game warden did not mention this fact, realizing that deer meat was all the group had to eat. Interview with Ethel Poage.

[48] In Ethel Poage's interview she stated that she often "felt just like an Indian," hauling her own wood and doing her laundry next to a stream.

consumption, coughed up blood most of the winter but remained on the mesa, too weak to go down to Grand Junction until spring. A nephew came on horseback one winter day and told Ethel that her father had died. He brought her a horse, then left her to make the preparations for the treacherous journey down off the mesa with her five year old daughter. She rode down in the middle of the night, after a major snowstorm, trying to keep her sleepy daughter from falling off the back of the horse.

Few accidents occurred, however, and the cold winter passed with infrequent tragedies. Walter Casto stated, "We were out there a hundred miles from a doctor, so we were conscious of ourselves and our fellow man."[49] They spent Christmas together, and had a turkey dinner to celebrate. They had few possessions and no money. Unlike workers in other western mining towns, the miners did not receive a weekly pay check. The men played cards, but had nothing to gamble with. Ethel crocheted the same spool of thread, given to her by Mrs. Smith, into a doily over and over again. Mostly Ethel and the men worked, six and seven days a week, and fell into their beds exhausted after dinner, all winter long.

The mining itself taxed the abilities of the men who worked for G.J. Smith. A sledgehammer and drill bit made up the only tools used by the men. Drilling was either done

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[49] Walter Casto, interview with author.

single jack or double jack, depending on the skill and strength of the men. A lone man could mine single jack, turning the drill bit with one hand, swinging the sledgehammer with the other. It took two to mine double jack, with one man holding and turning the bit, while the other man, hopefully a careful marksman, swung the sledgehammer.

The workers who went up to Calamity that winter made an agreement with Smith before they got there. The agreement stated that when Smith sold the ore, they would get paid. The group never received payment as Smith maintained he never sold the ore. The only reimbursement for their winter labors came in the form of the food they ate and the tobacco they smoked. This arrangement was not uncommon. Ethel Poage later worked at the John Brown mines, on a neighboring mesa, and failed to receive pay there also.[50]

The spring made the road passable once again, and the Thurbers and the miners left Calamity Camp. But the biggest boom, covered up and controlled by the federal government and major corporations, was just beginning. Two companies came into power in the area, controlling many of the mines and mills. The Vanadium Corporation of American (VCA) acquired the assets of the Colorado Radium Company and the Radium Luminous Metals Company, while the United States

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[50] Both Walter Casto and Ethel Poage seemed to feel lucky that they were even supplied with board.

Vanadium Corporation (USVC), a unit of Union Carbide, obtained the assets of the Standard Chemical Company.[51] These big corporations dominated the market for many years to come. Their policies, along with those of the federal government, controlled the lives of the men and women working on the Colorado Plateau.

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[51] "Uranium Exploration," 12.

CHAPTER II

GOVERNMENT EXPLORATION ON CALAMITY MESA

1939-1949

Shortly after Ethel Poage and Walt Casto left Calamity Mesa in the spring of 1938, the second mining boom to hit the Colorado Plateau in the twentieth century swept onto the mesa. After suffering a severe drop in 1933 and 1934, the Second World War revitalized the vanadium industry.[52] Gateway Alloys Inc. acquired the assets of the Atlas Corporation in 1939, including the Calamity claims, and reconditioned a 20-ton mill in Gateway that year to treat the ore from those claims and others nearby.[53]

Until this activity, the Gateway mining district had experienced very low production throughout the 1930s. After the Gateway Alloys Company built the mill, production expanded noticeably and immediately.[54] On July 2, 1940, President Franklin D. Roosevelt included vanadium as a material vital to the nation's defense, spurring a federal

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[52] Minerals Yearbook: 1937, prepared by the Bureau of Mines, United States Department of the Interior. (Washington, D.C.: U.S. Government Printing Office, 1937), 662.

[53] "Index to Lodes and Placers," and Minerals Yearbook: 1939, 629.

[54] "Uranium Exploration," 16.

effort to locate vanadium reserves.[55] The demand for vanadium increased dramatically as the world again entered war and this elevated demand spawned a series of government explorations on the Colorado Plateau in search of carnotite ore. After the bombing of Pearl Harbor on December 7, 1941, the United States declared war and the search for vanadium, and secretly uranium, dramatically escalated.

Once the nation entered World War II, the Colorado Plateau experienced a new and different mining era. Unlike earlier unregulated mining booms throughout the American West, the vanadium-uranium boom that continued from World War II into the 1960s was strictly controlled by the federal government.[56] The government involved itself in every area of ore production that was considered essential for the nation's defense. However, the involvement that most affected the Colorado Plateau during the 1940s consisted of wave after wave of government exploration projects.

Richard P. Fischer, after finishing his graduate degree in geology, became employed by the United States Geological Survey and committed the Survey to the search for vanadium from 1939 to 1944. The Survey, using the research information Fischer collected for his 1938 master's thesis,

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[55] Minerals Yearbook: 1941, 625.

[56] Duane A. Smith, "Boom to Bust and Back Again: Mining in the Central Rockies, 1920-1981," Journal of the West XXI (October 1982): 4.

explored the plateau area for vanadium reserves.[57] The federal government, dissatisfied with the amount of ore being mined, went a step further and formed the Metals Reserve Company in 1942 to stimulate the production of vanadium.[58] The shortage of vanadium became so serious that the federal government extended subsidies to miners and companies on the Colorado Plateau.[59]

This increased effort succeeded and by late 1942, ninety percent of the domestic output of vanadium came from the high mesas of the Colorado Plateau. At the end of 1943, vanadium production reached an all-time high. The United States Vanadium Corporation (USVC), a subsidiary of Union Carbide, dominated this market with mills at Uravan and Rifle. The Vanadium Corporation of America (VCA) also became heavily involved in the increased production of vanadium. These three companies, USVC, Metals Reserve Company, and VCA, created large stockpiles of residue tailings that surrounded their respective vanadium mills.[60] This domination of production coupled with the tailings that

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[57] William L. Chenoweth, "A Formal History of the U.S. Geological Survey's Colorado Plateau Project, 1947-1958," United States Geological Survey (Washington, D.C.: Government Printing Office, 1987), 1.

[58] Chenoweth, "The Uranium-Vanadium Deposits of the Uravan Mineral Belt," 169.

[59] "Uranium Exploration," 63.

[60] Beth M. Yoder Gilleece, "The Manhattan Project on the Colorado Plateau," Journal of the Western Slope 5 (Spring 1990): 26.

This domination of production coupled with the tailings that were later re-milled for uranium extraction, placed these companies, especially USVC, in a strong position when the government came to them for assistance in 1943.[61]

While the search for vanadium intensified on the Colorado Plateau in 1941, the Army Corps of Engineers began a project that would profoundly affect both the future of the Colorado Plateau and the world. By 1939 a small community of physicists had realized that a new, potentially horrible military weapon had become a distinct possibility.[62] As Germany swept through Europe, the United States became determined to pursue this prospect and a nuclear program unfolded as a classified project through the Office of Scientific Research and Development. The development of the nation's domestic uranium reserves, needed to produce U_3O_8 (uranium oxide) for the nuclear program, became a top national priority.

The Manhattan Engineer District (MED), formed in 1942, supervised and controlled the nuclear research program and the many scientists who were involved in developing the atom bomb. The project, placed under the direction of General Leslie R. Groves, relocated its headquarters from New York

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[61] Minerals Yearbook: 1943, 660.

[62] Ferenc Morton Szasz, The Day the Sun Rose Twice: The Story of the Trinity Site Nuclear Explosion, July 16, 1945, (Albuquerque: University of New Mexico Press, 1984), 10.

to Oak Ridge, Tennessee in 1943.[63] Earlier, in December 1942, the first self-sustaining nuclear reaction had occurred at the University of Chicago. This initial success reinforced the hopes of the scientists and military personnel involved in the experiment.[64] Assured that the project was rapidly progressing, Groves outlined five working units to provide the support needed for further research and development.

These units each specialized in an area critical to the advancement of the project. In a way, all of them had an impact on the mesas of western Colorado and eastern Utah. The Oak Ridge facilities, located in Tennessee, were controlled by the Clinton Engineer District. The New York Area oversaw the production of materials. The Hanford Engineer District was limited to the production of plutonium. The unit named Special Products, also located at headquarters in Tennessee, supervised security for the entire project. Finally, the Madison Square Area, the unit that most influenced the miners of the Colorado Plateau, managed the mineral procurement for the MED.[65] From 1943 forward, the federal government became increasingly involved in the mining on the Colorado Plateau, as well as in procuring uranium from abroad. The acquisition of raw

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[63] Gilleece, 20.

[64] Szasz, 14.

[65] Gilleece, 21.

materials guaranteed the progression of the project. In 1942, the single largest source of uranium was the Shinkolobwe Mine in the Belgian Congo (Zaire), and a reliable domestic source was desperately needed.[66]

During the summer of 1942, several governmental groups undertook continued exploration on the Colorado Plateau in an effort to expand the domestic vanadium-uranium reserve. The first Manhattan Engineer District exploration program began on May 3, 1943. The Bureau of Mines, in conjunction with the U.S. Geological Survey, conducted a core-drilling program on the Maverick and Calamity groups of claims. Officially, this was undertaken to stimulate the production of vanadium; but government documents, later unclassified, indicated the search included documenting uranium reserves as well. The USGS drilled a total of 5,885 vertical feet in 141 separate holes in the Calamity group of claims. This kind of government exploration continued on the mesa over the next decade.[67]

The federal government actively began acquiring raw materials for the MED all over the Colorado Plateau. Prior to the exploration by the Bureau of Mines and the U.S. Geological Survey, the Manhattan Engineer District signed

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[66] William Chenoweth, "Raw Materials Activities of the Manhattan Project on the Colorado Plateau," in Four Corners Geological Society Guidebook, 10th Field Conference, Cataract Canyon (Grand Junction, 1987), 151.

[67] Waulters, 9.

contracts with USVC, VCA, and the Metals Reserve Company. These companies had continuous activities on the plateau and the United States Government wanted a partnership. The MED also contracted with USVC to erect and operate a uranium-vanadium sludge plant at Uravan. The material fed into this plant came directly from the tailings left there from USVC's vanadium mill.[68]

In March of 1943 the Corps of Engineers sent 1st Lieutenant Phillip C. Leahy to Grand Junction to contact Blair Burwell of United States Vanadium Corporation (USVC) and begin the program of uranium procurement. The MED also contracted with VCA for the purchase and refinement of their vanadium-uranium sludge. By January 1, 1946, $692,350.00 had been paid to VCA, and $216,300.00 had been paid to the Metals Reserve Company. Leahy supervised these three companies and their activities, and acted as mediator when conflicts arose among them; conflict which inevitably arose due to the intense competition between these companies for the lucrative government contracts. VCA and Metals Reserve felt that USVC received preferential treatment due to the extensive nature of that company's government contracts. However, MED also assisted all of the companies with ore

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[68] Chenoweth, "Raw Materials Activities," 151.

processing techniques, including Vanadium Corporation of America and Metals Reserve.[69]

1943 also saw the addition of another operation to the Madison Square Area of the Manhattan Engineer District. This new operation became very involved in the Calamity Mesa area. The Murray Hill Area, a division of the Madison Square Area, developed a company called the Union Mines Development Corporation (UMDC) under the aegis of Union Carbide and Carbon.[70] Thus both Union Mines Development Corporation and United States Vanadium Corporation were searching for uranium on the Colorado Plateau. Both were subsidiaries of Union Carbide and were contracting with the federal government. Although each company viewed the other as a competitor, neither company was aware of the other's true role as a division of the same parent company.

Union Mines Development Corporation's role in the Manhattan Project revolved around geographical exploration. The principal purpose of this project was to

> reconnoiter the Colorado Plateau region, with sufficient study of its general geology, stratigraphy, and structure; and to assess the distribution, magnitude, and tenor of its ore deposits as was considered necessary to completely

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[69] Gilleece, 27. Company employees had to undergo extensive investigation by the federal government before they could work on the uranium procurement program. Anyone found unsuitable by the government could have been released from his or her job.

[70] Gilleece, 21.

> evaluate the ultimate potential uranium resources of the region.[71]

The contract between the United States government and Union Carbide maintained that the government would cover all costs incurred during this exploration. UMDC operated like a government agency during this period, with its activities considered top secret.[72]

Union Mines Development Corporation structured its work into four divisions. These divisions were located throughout the country.[73] The Bibliographical Search Division, based in New York City, employed twenty-eight people who collected data and information for an early appraisal of uranium deposits. The Exploration Research Division, also located in New York, worked on improving field instruments and methods used for exploration, such as the Geiger-Muller Counter and various chemical tests for field use.[74]

The last two divisions of UMDC located on the Colorado Plateau in an effort to expand exploration and drilling. The Metallurgical Research Division investigated different

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[71] "Uranium Exploration," 14.

[72] Gilleece, 23. See also Chenoweth, "Raw Materials Activities," 152-153.

[73] Chenoweth, "Raw Materials Activities," 151-153.

[74] Gilleece, 23-24. In 1943 UMDC contrived to have all the testing done at Linde Air Products Co., in New York. Linde Air Products Co. was also a subsidiary of Union Carbide.

ways to process the carnotite ore, which was prevalent in the plateau area. The Denver Equipment Company in Denver, Colorado, contracted with this research division to do the laboratory research on a fee basis. The Field Exploration Division brought the plateau and its ore reserves directly into the Manhattan Project. This division, though based in New York City, had a field office in Grand Junction. Mining engineer Frank J. Belina moved to Colorado and directed the Colorado office.[75]

Two-thirds of the work force employed by the Field Exploration Division worked on the Colorado Plateau, mapping and evaluating the ore-bearing areas. In an effort to cloak the real purpose of the government exploration the reports of the UMDC geologists were classified as secret and as such could not even contain the word uranium. This group of geologists prospected and mapped all known exposures of the Salt Wash Member of the Morrison formation, including those on Calamity Mesa.[76]

By 1946, all field work by the UMDC had been curtailed. However, as part of their three year investigation, the geologists recommended mining areas that showed ore-bearing potential for acquisition by the federal government.[77] Acting on this recommendation, the federal government

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[75] Gilleece, 24.

[76] Chenoweth, "Raw Materials Activities," 153.

[77] Ibid.

acquired three significant properties on the Colorado Plateau. Among these properties were the forty-two claims of the Gateway Alloys Company on Calamity Mesa.[78] Consequently, the claims became the property of the United States Government which directed their mining and development.

The major role of the federal government was playing on the Colorado Plateau became common knowledge when in the summer of 1945, the United States military detonated two atomic bombs in Japan and ended World War II. The people involved with the various divisions of UMDC, especially the miners working on the mesas on the Colorado Plateau, became aware overnight of the power of atomic energy as well as the classified mission of the Manhattan District.

The Manhattan Engineer District acquired approximately 1,349 tons of domestic uranium oxide (U_3O_8), by January 1, 1947, at a cost of $2,072,330.00. USVC, VCA, and the Metals Reserve Company supplied most of the ore.[79] Utilizing foreign ore reserves, the MED procured a total of 9,469 tons

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[78] Ibid. Other properties purchased by the federal government included a 960 acre Navajo lease in the Carrizo Mountains of northeast Arizona and the holding of the North Continent Mines, Inc. at Slick Rock, San Miguel County, Colorado. The total acquisition cost $276,000.00.

[79] Ibid, 152.

of U_3O_8 for the Manhattan Project.[80] Thus the domestic sources on the Colorado Plateau provided fourteen percent of the uranium for the project which developed the bombs dropped on Hiroshima and Nagasaki.[81]

By January of 1947 the need for the Union Mines Development Corporation and its exploration capabilities had ended, as private industries had substantially increased their exploration capacities. The UMDC employed 129 people at its peak activity in July, 1944, providing jobs throughout the Plateau. However, the Manhattan Engineer District ordered the project closed in 1946. By January of 1947, UMDC ceased to exist. The cost of the project totaled over two million dollars and the many reports filed by the geologists of the UMDC were not declassified until the late 1950s. Union Carbide, however, maintained copies of the files, along with the Atomic Energy Commission.[82]

The Manhattan Project, through the activities of the UMDC and the stimulation of USVC's, VCA's, and Metals Reserve Company's production, profoundly influenced the economic growth and prosperity of the Colorado Plateau. The

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[80] Ibid. 6,983 tons of this total came from the Shinkolobwe Mine in the Belgian Congo and 1,137 tons were purchased from the Eldorado mine on the Great Bear Lake in the North West Territories of Canada.

[81] Ibid.

[82] Gilleece, 25. The possession of these files had to provide some advantage to Union Carbide in the competition among mining companies on the Plateau.

investigation performed by UMDC designated Calamity Mesa as an area with potential ore reserves, and as such the federal government retained control of the area and the mines located there. Local people discovered new employment opportunities as companies expanded and as the federal government became a major employer. However, the impact of the impending uranium boom and the governmental control of that mineral was only beginning.

One of the fundamental problems the government faced was identifying who should control atomic energy and its byproducts. President Harry S Truman recommended legislation addressing the problem in several messages during the fall of 1945. On August 1, 1946 the Atomic Energy Act created the Atomic Energy Commission. The act gave the commission "very broad powers of control over both the military and industrial production and utilization of atomic energy."[83]

The act delineated the powers of the commission and set up a five-member panel to run the AEC. Four identifiable divisions, including research, production, engineering, and military application were organized within the commission. The act strictly outlined the constraints under which

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[83] Minerals Yearbook: 1947, 1213. The Atomic Energy Act passed by the Congress of the United States was preceded by the United Nations Atomic Energy Commission, which was established on January 24, 1946. This commission was initiated to ensure the peaceful use of atomic energy throughout the world.

companies or individuals involved in the uranium industry could operate. No person could manufacture or acquire facilities for the production of fissionable materials except by license. The act also stipulated that no individual could possess any fissionable material except as authorized by the Atomic Energy Commission.

The act also tightly specified who could control the ore that contained the fissionable material used for manufacturing nuclear weapons or power. No person could receive or deliver any source material after removal from its place in nature unless licensed by the AEC. The regulations were not limited to the mills that received the ore. Individual miners also found their prospecting operations restricted.[84] The act authorized the commission to conduct exploratory operations, investigations, and inspections to determine the location and extent of ore deposits. All the materials, once found, were reserved for the use of the United States.[85]

In a provision that proved critical in the impending Cold War with the Soviet Union, the 1946 act authorized the commission to develop and produce atomic weapons to the

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[84] Minerals Yearbook: 1946, 1205. All public lands containing deposits of radioactive minerals were withdrawn from disposal and reserved for the use of the United States by Truman's Executive Order 9613 of September 13, 1945.

[85] Ibid, 1213-1214. Also stated in the act was a specific warning to those who had participated in the MED project. They were not to use the information acquired during that period for their own benefit.

extent directed by the President. And any person found disclosing any restricted data concerning the production of fissionable materials, atomic weapons or atomic power, with the intent of injuring the United States, would be punished by death or life imprisonment.[86]

Truman was also very concerned about organization and administration. On December 31, 1946, he issued Executive Order 9816, which transferred the Manhattan Engineering District to the Atomic Energy Commission. This action transformed the advancement of atomic energy from a totally secret military activity to a civilian organization, accountable to the public record. Uranium procurement, which had been carried out secretly by the Manhattan Engineer District, was continued by the AEC, which now made the agency's need for uranium public.[87] This public announcement of the necessity for further domestic uranium development profoundly affected the city of Grand Junction and the entire Colorado Plateau.

To encourage further development, the AEC requested a proposal from the U.S. Geological Survey outlining an exploration project to be done by the USGS. Richard P. Fischer, the geologist who had earlier surveyed the Calamity Mesa region, conceived the idea for the project based on his experience with the area and the knowledge gained during the

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[86] Ibid, 1214.

[87] Chenoweth, "Raw Materials Activities," 154.

USGS's vanadium survey of 1939-1944. In April of 1947, Fischer and A.P. Butler, an associate, prepared the proposal for the AEC and the commission quickly accepted it.[88] The UMDC had acquired the claims in 1946, on behalf of the government, and in 1947, officially consigned ownership to the AEC. These claims included all the claims on Calamity Mesa, including the Dixie claims on which the remaining stone houses stood.[89] As the USGS spread over the Colorado Plateau looking for additional resources and analyzing known sources of uranium, Calamity Mesa became a key area of exploration and development once again.

Shortly after its initial organization, the AEC began signing purchasing contracts with the major companies on the Colorado Plateau. In fact, the first contract executed with Vanadium Corporation of America in May of 1947, designated a beginning delivery date to the AEC of November 1947. The uranium concentrate provided by VCA came from the company mill in Naturita, Colorado, not far from Calamity and Gateway. United States Vanadium Corporation followed suit, signing a concentrate purchase contract in October of 1947. Their concentrates came from the Uravan mill, which had been utilized by the MED.[90] By December of that same year, the

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[88] Chenoweth, "A Formal History of the U.S. Geological Survey's Colorado Plateau Project," 1-2.

[89] Ibid., i, 7.

[90] Chenoweth, "The Uranium-Vanadium Deposits of the Uravan Mineral Belt," 169.

AEC established the Colorado Raw Materials Office in Grand Junction to oversee AEC uranium procurement.[91] Later the Colorado Raw Materials division combined with the Colorado Exploration Branch to form the Grand Junction Operations Office, which operated out of the AEC compound in Grand Junction.[92]

The AEC's effort to find additional uranium resources found immediate success in 1948. In that calendar year alone, the USGS drilled 130,000 vertical feet.[93] The government exploration program continued from 1948 until 1956 and included drilling, geological investigations, airborne surveys, and geophysical research.[94]

This exploration project focused on Calamity Mesa during 1949. The Colorado Exploration Branch of the New York Raw Materials Office prospected the uranium-vanadium deposits in the Salt Wash Member of the Morrison formation

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[91] Neilsen B. O'Rear, "Summary and Chronology of the Domestic Uranium Program" TM-187 (Grand Junction: United States Atomic Energy Commission, 1966), 1.

[92] At this time, the nation's supply of uranium fell significantly short of military needs, and various programs were instituted to remedy the situation. Included in this was the continued procurement of uranium from the Belgian Congo and Canada. Al Albrethsen, William Chenoweth, and Frank McGinley, "A Summary History of the Activities of the Grand Junction Office of the AEC, ERDA, and DOE," (U.S. Department of Energy, Grand Junction, Colorado, 1986, mimeographed), 1. This document was supplied by William Chenoweth.

[93] O'Rear, 2.

[94] Ibid., 8.

over an area of approximately eleven square miles on the mesa. This project intended to determine the ore reserve potential of the wide, explored area situated between the Calamity and Maverick groups of claims. Additionally, the group included exploration of nearby geologically favorable areas. It was determined that these peripheral areas would not be explored by private companies due to the depth of drilling necessary and the amount of capital involved.[95]

Thus from June of 1948 until January of 1949 the United States Geological Survey, acting for the AEC, conducted a diamond drill program on the Maverick and Calamity groups. Through the efforts of the USGS the Commission discovered significant additional deposits on Calamity Mesa. The estimate of the deposits came to 31,170 tons of indicated reserves and 14,500 tons of inferred reserves. The total cost of this exploration was $231,878.92.[96]

Loren Warren, of Gateway, Colorado, worked for the AEC during this project and was stationed on Calamity Mesa. He

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[95] Waulters, i. Previous exploration on Calamity Mesa included 7,209 feet of core drilling in 177 holes on the Maverick and Calamity groups of claims by the Bureau of Mines during the summer of 1943 and 47,022 feet in 729 holes on the same groups of claims by the USGS from June 1948 to January 1949. More exploratory drilling would follow the AEC's exploratory efforts as well. The federal government subsidized the mining companies in many aspects of their operations during this period.

[96] Ibid., ii. Indicated reserves were those for which the grade was computed from drill-hole samples, while inferred reserves are based on broad knowledge of the geological nature of the deposits.

drove a jeeplike weapon carrier over the mesa taking ore samples for eighteen months. Drilling for ore samples dominated most of his time while on Calamity, as it did many of the approximately thirty workers who were there.[97] The truck trails which led to the mesa, became impassable during wet weather, causing the government workers to find themselves stranded on Calamity as winter approached. However, unlike prior residents of Calamity Camp, these workers maintained radio contact with the Grand Junction office throughout the course of the project and often brought their wives up to the mesa on the weekends.[98]

While the men working on Calamity Mesa lived there for almost eighteen months, they did not inhabit the stone houses found there. The AEC furnished the contractor leading the crew with trailers for use as housing and mess hall facilities. Heating stoves and generators, luxuries unheard of before on the mesa, found their way to Calamity Camp during the men's stay. A shower house and electrical wiring to all buildings was also installed, all at the expense of the AEC. During this period the buildings in the camp consisted of the five remaining rock houses, a mess hall, generator house, and a shower house built for the USGS

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[97] Loren Warren, interview with author, Gateway, Colorado, 9 August 1990.

[98] Waulters, 36. These radios were standard ten-watt transmitter-receiver types donated for the project by the U.S. Grazing Service.

in 1948. Later, in 1949 the AEC constructed two quonset bunk houses and one quonset office building.[99]

The broad program of exploration, which occurred during 1948 and 1956 led to the withdrawal of 700 square miles of public domain land. This in turn spawned two AEC leasing programs, which dominated uranium mining on the Colorado Plateau for the next twenty years. The first leasing program was in place between 1949 and 1962.[100] United States Vanadium Corporation took advantage of this program and in 1949 leased the Calamity and Maverick groups of claims from the Atomic Energy Commission.[101]

The AEC's exploration program was successful in the early years of its operation, but the activities of the Soviet Union in 1949 quickly made apparent how critical that success was for the nation's security. With the first Soviet explosion of an atomic bomb, the Cold War assumed a new gravity.[102] A sense of urgency came over the Colorado Plateau; and individual miners, as well as the companies involved, felt increased pressure to develop the domestic uranium reserve.

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[99] Ibid., 32.

[100] Albrethsen, Chenoweth, and McGinley, 2.

[101] Waulters, 9.

[102] Minerals Yearbook: 1949, 1250.

CHAPTER III

THE COLD WAR ON THE COLORADO PLATEAU

1945-1970

The Colorado Plateau boomed under the influence of the federal government during the post-war period. With heightening tensions between the Soviet Union and the United States, the need to find uranium and expand the domestic reserve of this critical mineral intensified. With the 1949 Soviet explosion of an atomic bomb, urgency became the essence of the atomic energy program.[103] The Atomic Energy Commission released its first price schedule in 1948 and those prices became effective in April of that year. From that point on, government subsidies became a critical factor in the uranium boom of the 1950s and 1960s.

By guaranteeing a market for domestic uranium ores, the government seemed to encourage small independent production. But as production costs increased over the course of the 1950s, big companies took over the market and small producers increasingly lost their independence and their ability to survive.[104] The critical need for uranium eventually waned, however, and by 1960 the AEC began to

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[103] Minerals Yearbook: 1950, 1250.

[104] Michael B. Husband, "'History's Greatest Metal Hunt': The Uranium Boom on the Colorado Plateau," Journal of the West XXI (October 1982): 20.

limit its uranium purchases and its support of the domestic uranium industry.[105] This later turn of events had critical consequences for the Calamity Mesa area. Since the AEC had withdrawn land on the mesa as an area of potential reserves, the chances for independent miners to make a profit on the mesa lessened. The AEC determined who would develop claims by judging whose ability to exploit the resources was the greatest. Thus, major companies, most notably Union Carbide (USVC), leased the claims from the AEC. By contracting with miners for their labor, the companies controlled the claims and the amount of money individual miners could make from those claims. The Atomic Energy Commission and the group of companies that dominated the market controlled both the uranium boom on the Colorado Plateau and the working experience of the majority of miners.

The AEC established guaranteed prices for uranium ore in April 1948, through a series of Domestic Uranium Procurement Circulars. The commission controlled the market for uranium through these circulars and moderated the price paid per pound of uranium oxide according to the military demand for the material.[106] These circulars delineated the conditions under which procurement contracts were negotiated with mining companies. Independent miners, however, took their ore to AEC buying stations with a promise, not a

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[105] Ibid., 22.

[106] Albrethsen, Chenoweth and McGinley, 1.

contract, that if they brought in a truck-load of ore, the AEC would pay them a competitive price for that ore.[107] These ore-buying stations functioned in the beginning of the boom to stimulate production, before the major companies had fully developed their milling capabilities.[108]

After the completion of various company mills, the AEC stations closed down to allow for private enterprise to take over. The AEC initially offered little incentive to independent miners, with initial low prices for ore. In April of 1948, the base price offered for uranium ore was $1.50/pound. These years made up one of the most discouraging periods for independent miners. Low ore prices and poor market conditions offered them little hope of prosperity. However, international events again touched the Colorado Plateau as President Truman declared a state of national emergency on December 16, 1950. The Korean War and the newly authorized construction of a hydrogen bomb led to the rapid expansion of all phases of the atomic energy program. This greatly increased activity in Grand Junction and all over the Colorado Plateau.[109] The fifties became the key decade of the uranium boom.

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[107] Don Hill, interview with author, Grand Junction, Colorado, 30 August 1990

[108] O'Rear, 7.

[109] Minerals Yearbook: 1950, 1260.

During the early years of the fifties, the federal government announced that it would buy all the uranium oxide the miners on the Colorado Plateau could produce at $12.51/ pound.[110] In February of 1951 the AEC declared that persons who found new deposits of uranium ore would be paid an additional $3.50/pound for up to 10,000 pounds. Maximum bonus payments ranged from $15,000 to $35,000. These payments came directly from the AEC after they approved the miner's application.[111] This bonus program and the guaranteed minimum base price stimulated production even further, and offered a glimmer of hope to independent producers.[112]

The Atomic Energy Commission participated in procurement programs such as these throughout the 1950s. During this period the commission built over 1,253 miles of access roads in the West and maintained a broad policy of exploration.[113] The AEC participated in the research and development process, searching for better ways to process uranium ore and developing accurate sampling and assaying

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[110] Shumway, 180.

[111] Mining Yearbook, (Denver: The Colorado Mining Association and All Western Associations, 1954), 33. Prices per pound of uranium concentrate varied according to the uranium oxide content of the ore.

[112] Minerals Yearbook: 1951, 1299.

[113] O'Rear, 12.

procedures.[114] The success of these various approaches became evident as the AEC ascertained an increasing level of ore reserves and purchased higher amounts of ore each year.

The annual mining rate of uranium ore in the West started at 54,000 tons in 1948, and reached a peak in 1961, with eight million tons of ore being mined. In 1948, the AEC bought 110 tons of uranium oxide for $19 million. By 1961, the AEC bought 17,671 tons of uranium oxide for $299 million.[115] The price per pound of uranium oxide guaranteed by the government steadily declined during the fifties, as the amount purchased increased and ore became more readily available, moving from $12.51/pound in the early years to $8.47/pound in 1961.[116]

During the fifties, research and development labs discovered new uses for nuclear power. Atomic weapons procurement experienced major growth with the development of a nuclear submarine and the explosion of the first hydrogen bomb in 1952. Increasingly, weapons tests at the Nevada Proving Ground created more varied uses for nuclear energy in military weapons. Commercial electrical power from nuclear fuel approached reality by 1954.[117] International

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[114] Ibid., 26.

[115] Ibid., 3.

[116] Ibid., 4.

[117] Minerals Yearbook: 1952, 1083; Minerals Yearbook: 1953, 1203; and Minerals Yearbook: 1954, 1241.

interest in controlling the uses of atomic energy followed, with the First International Conference on the Peaceful Uses of Atomic Energy at Geneva occurring in early August, 1955.[118]

However, this growth did not continue into the sixties. The AEC responded to the newly apparent oversupply of uranium by announcing a cut in the acquisition rate. In May of 1956, after estimating the production and demand of uranium for the years to come, the AEC announced a new domestic uranium procurement program, effective from April, 1962, through December, 1966. This program set a flat rate of $8.00/pound for uranium oxide. As early as October of 1957, the AEC alerted those involved that "it is no longer in the interest of the government to expand the production of uranium concentrate."[119] The government then stated that it would only buy appropriate quantities of concentrate derived from ore reserves developed prior to November 24, 1958, during the 1962-1966 period.[120]

Although the Atomic Energy Commission had counted on the private market for uranium to be fully developed by 1966, it became evident in 1962 that the private market would not be functioning at a level necessary to sustain the domestic uranium industry. Thus, in November of 1962, the

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[118] Minerals Yearbook: 1955, 1213.

[119] O'Rear, 4.

[120] Albrethsen, Chenoweth and McGinley, 4.

AEC announced its stretch-out program for 1967-1970. This enabled companies to postpone scheduled deliveries of ore and effectively stretch them out over those three years.[121] By the close of 1970, the Atomic Energy Commission's procurement program had ended.[122]

The evolution of the domestic uranium industry had profound consequences for the men and women who mined on Calamity Mesa and throughout the Colorado Plateau. As prospecting reached its zenith in 1955, many small producers began selling out. Deep drilling, which became increasingly necessary with the depletion of surface ores, required more capital than small producers could afford. Big companies became increasingly powerful, with an unbeatable combination of financial backing and technical resources.[123]

As the AEC's price for uranium continued to fall, independent producers struggled to make a living. Many autonomous mining properties could not maintain a profitable operation at the production levels necessary to preserve a contract with the mills. Domination by the major companies, and the struggle of self-reliant miners played a dual role in the mining that occurred on Calamity Mesa during the fifties and sixties. These big companies had a long history

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[121] Ibid., 5.

[122] Ibid. By the end of 1970 the AEC had purchased uranium concentrate containing 348,818,438 pounds of uranium oxide for $2,979,390,249.00.

[123] Minerals Yearbook: 1956, 1245.

of competition on the Colorado Plateau mesas. In order to understand their posture during later decades, their immediate post-war activities need clarification.

The AEC established strong relationships with three major mining companies soon after its formation. By May of 1947, the AEC had signed contracts for procurement of uranium oxide with the Vanadium Corporation of America and United States Vanadium Corporation. The Metals Reserve Company, developed earlier by the government to stimulate vanadium production, had transferred operations to USVC in May 1942, creating a windfall for USVC.[124] Although the AEC initially had difficulty finding companies to mill the uranium ore, Climax Uranium Company began building the first mill in the United States designed specifically for the production of uranium oxide in 1949.[125] Between 1947 and 1960, the Atomic Energy Commission executed thirty-two procurement contracts.[126] Thus, VCA, USVC, and Climax moved into position as the dominant companies involved, not only in exploration as has been discussed, but also in the government's procurement program.[127]

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[124] Shumway, 114.

[125] O'Rear, 14.

[126] O'Rear, 17.

[127] Chenoweth, "The Uranium-Vanadium Deposits of the Uravan Mineral Belt," 169.

By the 1950s, the Vanadium Corporation of America and United States Vanadium Company had a long history of competition on the Colorado Plateau. Active in the earlier vanadium-uranium boom, both companies struggled during the bust period of the 1930s, as richer sources of ore materialized in the Belgian Congo and in Canada.[128] During the trying years of the thirties, these competitors cooperated with each other, with VCA purchasing USVC's surplus ore. However, as the market improved in 1938, the relationship between the two companies became increasingly strained.[129]

This increased competition did not open the door for other operators to easily move into the market. These two companies maintained enough cooperation to discourage third party competition. Other companies were not the only target of USVC and VCA. USVC moved into the area around Gateway to try and keep small producers from milling their own ore. When the Gateway Alloys Mill, originally built in the 1920s, was reconditioned to mill the ore produced by independent miners near Gateway (including those on Calamity Mesa), USVC leased many of the claims that supplied its ore and sent that ore to the company mill in Uravan.[130]

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[128] Shumway, 92.

[129] Ibid., 107.

[130] Ibid., 113. The Gateway Alloys Mill closed down in 1940.

In Gary Shumway's study of the uranium industry on the Colorado Plateau, he stated:

> For sometime, USVC and VCA had been absorbing any deposits that appeared to be commercially exploitable. They refused to pay more than 21 cents per pound for vanadium, keeping most miners marketing vanadium in peonage. This permitted the companies to purchase almost any claims they wanted at a low price, while controlling production from the rest of the mines. Furthermore, the companies did not permit the development of independent milling companies.[131]

By 1944, many miners again felt that there was no future in the mining of vanadium-uranium ore. Uranium sales had been banned, due to the classified Manhattan Project, and many independent miners sold their claims to mining companies and agents of the federal government. Miners had experienced affluence for a brief moment, selling vanadium at the outset of war, then returned to poverty due to the monopoly of the companies.[132] On the threshold of another major boom, disgruntled workers filed a criminal anti-trust suit against USVC and VCA in July of 1945. Although this suit was eventually thrown out of court, for a time the miners felt empowered by this action and what they determined would be a certain victory.[133]

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[131] Ibid., 115.

[132] Ibid., 136.

[133] Ibid., 137. For a more complete accounting of this important court action, see Gary Shumway's dissertation, "A History of the Uranium Industry on the Colorado Plateau."

The involvement of the federal government remedied this situation somewhat during the late 1940s. USVC, charged to do so by the federal government, had to encourage miners and independent mills to produce the essential uranium reserve. However, the company never enabled the independent miners to make a profit on their contracts. USVC and VCA still collaborated to keep the price paid for ore well under the federal ceiling and worked to keep the allowed price from being made public.[134]

The Atomic Energy Act of 1946 provided some protection for the independent miners, but overall the domination of the major mining companies continued and even increased in the 1950s and 1960s. Most of the ore produced on the Colorado Plateau during this period came from the larger companies and from individuals who leased company claims. USVC not only produced ore from its larger mines, but leased smaller mines and claims all over the plateau to individual miners. VCA and Climax Uranium Company duplicated this activity with their holdings.[135]

These companies bought all the ore from their lease-holders, collected royalties from those purchases, and then in return provided financing, geologic and engineering advice for development work, and conducted drilling programs

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[134] Ibid., 119. USVC carefully guarded the fact that it had been authorized to pay up to fifty cents a pound for vanadium, and instead paid only thirty-one cents a pound.

[135] "Uranium Exploration," 22.

on the recommendation of the company geologist.[136] Lease-holders agreed to lease the property and paid all the costs incurred in the mining. The lease-holder then technically owned the ore he or she produced and paid a royalty to the company from which the claim was leased. Lease-holders only received financial help for further development from the company if a company representative approved or recommended the exploration or drilling.

The hiring of contractors provided the companies with another method of controlling the production of the mines. Companies used contractors strictly to furnish labor for their mining. The contractor never owned the ore he or she produced, rather the company paid him or her for labor rendered. Both USVC and Climax Corporation operated their mines on Calamity Mesa in this manner.

Two kinds of contracts dominated the arrangements made between miner and company. With a regular contract, USVC hired a contractor to go and mine ore for them. The company owned the ore at all times and paid the miner for the work dispensed. USVC paid extra for any work done of a permanent nature and provided supplies for that work, such as logs for timbering mine shafts. The contractor provided everything that was expendable, such as mining machinery and explosives, and all personal supplies such as food. The companies even devised a clean-up contract, which differed

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[136] Ibid.

from a regular contract in that the miner was sent to a mine to literally clean up what ore remained after a regular contract had been fulfilled. The miner received a higher price per pound for the ore discovered, but he or she paid for all expenses incurred in that mining.[137]

In this system of production the mines themselves had names for tracking purposes, while the contractors had numbers. This further removed the person from his or her labor. A ticket with the miner's number on it went with the ore to the mill where it was weighed. Production engineers kept close track of the mines and the contractors working them, and told the miners where and what to mine. If the contractors developed any area not specified by the production engineer, the contractor would not be paid for his labor or materials.[138]

Throughout the late fifties and early sixties, USVC employed over one hundred contractors. Although not many of the mines actually owned by USVC were on Calamity Mesa, the company had six to eight contractors living and working on the mesa during the fifties. Some, but not all, of these contractors had their families with them, and some of the contractors lived in the stone houses originally built in

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[137] Verne Bishop, interview with author, Grand Junction, Colorado, 10 July 1990.

[138] Ibid.

the twenties.[139] This kind of contract labor led to a strict and competitive work environment, and as a result, no kind of community was encouraged by the company.

Climax Uranium Company operated their mines on Calamity Mesa in much the same way. The Calamity and Outlaw mines formed the hub of Climax's operation and furnished the bulk of ore to be fed into the Grand Junction plant. Although the claims owned by Climax were operated on contracts with independent producers who owned all or at least part of their equipment, Climax Uranium Company attempted to provide the miners on Calamity Mesa with some semblance of a community.[140]

Climax maintained a fully-equipped modern camp and boarding houses on Calamity and Outlaw Mesa. The boarding houses provided room and board for single miners, while married couples brought their own primitive trailers up to the mesa. While the Arrowhead camp on Calamity Mesa did not go as far as to be officially considered a company town, Climax had a much greater presence in the area than did USVC. The fifteen to twenty miners that lived in each boarding house worked on a contract basis, with two or three men to a contract. Climax paid the men for what they mined, along with any extra drifting (or digging) they did. Like

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[139] Verne Bishop stated in his interview that Bill Rymal lived in one of the stone houses, as did Albert Nickerson and his wife, and a Mr. Tucker and his wife.

[140] Mining Yearbook, 49.

USVC, Climax did not consider the miners employees, but rather contractors, limiting their rights and negotiating power.[141]

As the boom progressed, Union Carbide Corporation, the parent company of USVC, increasingly dominated the market and set the tone of the industry. As uranium production accelerated and gained force, numerous publications appeared promoting the area and enticing people to come and join those who were mining on the plateau. In 1952, Union Carbide prepared a pamphlet promoting the uranium industry entitled, "Mesa Miracle in Colorado, Utah, New Mexico and Arizona." The pamphlet first introduced the reader to the geographic area, and then praised those involved for the "remarkable spirit of teamwork displayed throughout every phase of uranium production."[142]

Along with this rather misleading praise, the company then outlined the AEC's role in the region, the expected expenditures, the techniques used for exploration, and

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[141] Anthony Mastrovich, interview with author, Grand Junction, Colorado, 6 July 1990. The Vanadium Corporation of America duplicated this kind of activity all over the Colorado Plateau, but did not have a sizeable presence on Calamity Mesa.

[142] Mesa Miracle in Colorado, Utah, New Mexico, and Arizona, (Grand Junction, Colorado: United States Vanadium Company, 1952), 5. Union Carbide also cooperated with the Bureau of Mines and produced a film with accompanying pamphlet, The Petrified River: The Story of Uranium, (Grand Junction, Colorado: Union Carbide Corporation and the Bureau of Mines, U.S. Department of the Interior, 1954), which traced the geological formation of uranium deposits.

estimated that from 4,000 to 5,000 people were taking part in the uranium program on the plateau. However, the most interesting section of the pamphlet dealt with the miners themselves. The picture the company presented to the public was a romantic one.

> The miners are friendly people, though some may think they lead a rather lonely life. Yet they seem to have the world at their feet. . . . Many miners live in cabins close to the mine. They will move on to other properties, when the deposit they are working on is exhausted.[143]

Other publications promoted this seeming adventure as well. The Engineering and Mining Journal declared that the most helpful contribution it could make to the uranium industry was to furnish a clear picture of the uranium situation as it stood in 1954.[144] The journal then outlined where to look for uranium and provided in-depth geological data for the serious miner.

The information dispensed by the journal did not stop with mining information. Also included were instructions on how to get into milling and a listing of the AEC requirements for setting up a uranium mill. But the most interesting bit of information provided by this publication was found in the small print. Some problems were outlined for "serious consideration." Ventilation was found as one

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[143] Mesa Miracle, 17.

[144] "U_3O_8 - Formula for Profits," Engineering and Mining Journal 155 (September 1954): 88-116.

problem listed in this section, as the "possibility of a radon hazard is recognized by mining operators and Public Health authorities." The journal then went on to state, "Fortunately, however, no evidence has turned up to date indicating that radon has proved harmful to mine workers."[145] In 1954, no steps had been taken to ensure that mines were ventilated, and miners were unknowingly developing lung cancer due to radon exposure.

The types of publications involved in promoting the uranium boom ran the gamut from serious scientific journals to popular magazines. The cover story of Life Magazine glamorized the uranium boom as "History's Greatest Metal Hunt," on May 23, 1955. Life offered a basic guide to the uranium seeker, from listing the necessary equipment, to showing the nation what fashionable prospectors were wearing on the mesas of the Colorado Plateau. Rudimentary maps illustrated the key ore locations and color photographs labeled the different types of desirable ore. The magazine encouraged readers to join the tens of thousands of weekend prospectors.[146]

The federal government also published pamphlets outlining the steps to take if one wanted to hunt for uranium. Prospecting for Uranium provided detailed

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[145] Ibid., 102.

[146] "History's Greatest Metal Hunt," Life Magazine, 23 May 1955, 24-35.

instruction on how to sell uranium ores to the Commission and listed the price circulars issued by the AEC. The pamphlet also informed the reader of land restrictions, and summarized the procedure for staking a claim on public, state, and private land.[147] Here again, the danger involved in mining uranium was concealed, as the federal government assured the public that "It is no more dangerous to prospect for radioactive minerals than it is to prospect for other types of minerals."[148]

The uranium boom of the 1950s and 1960s captivated the public imagination. Highly publicized accounts of those who got rich quick dominated the headlines. Penny stock speculation escalated to a fevered pitch with the emergence of credible and not so credible mining companies. For several exciting years, under the regulation of the AEC, companies profitably exploited the uranium reserves of the Colorado Plateau. The Cold War supplied the impetus for the whole movement as the government told the miners that they were on the front lines of American defense.[149]

However, the era came to a close almost as quickly as it arose. The quick build-up of the federal government's

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[147] United States Atomic Energy Commission, Prospecting for Uranium, (Washington, D.C.: Government Printing Office, 1957), 70.

[148] Ibid., 81.

[149] Grand Junction Daily Sentinel, 12 September 1952.

stockpile, a cutback in the production of nuclear bombs, the failure of nuclear energy to gain acceptance, and the problem of radiation control in the mines, all placed the uranium industry in sore straits.[150] As early as 1963, a world-wide retrenchment in uranium mine development and production took place. The demand for uranium for military purposes decreased substantially and three mills on the Colorado Plateau shut down.[151]

By the next year many of the big mines started to close down and President Lyndon Johnson signed Public Law 88.489, which amended the Atomic Energy Act and provided for a transition from government to private ownership of nuclear materials.[152] Mine production of uranium continued to decline throughout the following years and mines and mills closed down. The termination of the AEC's purchasing program left only the electric utility companies as purchasers of uranium ore. As nuclear power generation failed to gain widespread acceptance, uranium prices and production continued to decline.[153]

Even though the Atomic Energy Commission and the mining companies dominated the uranium boom, the real story of

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[150] Husband, 23.

[151] Minerals Yearbook: 1963, 1169.

[152] Minerals Yearbook: 1964, 1119.

[153] Chenoweth, "The Uranium-Vanadium Deposits of the Uravan Mineral Belt," 170.

uranium mining on the Colorado Plateau belonged to the men and women who worked there. Throughout the entire boom period, miners worked under a variety of conditions. Some worked for themselves on privately owned mines. Most worked for the companies, either as contractors or lease-holders, and some miners worked for those men who held the contract or lease as secondary laborers. All of the miners worked in unventilated mines until the late 1950s and some continued to do so after that date, not realizing the consequences. Their lives were glamorized by the public; they were viewed as living the ultimate adventure. Even the miners themselves look back at that time with fondness, remembering when they participated in the biggest mining boom of the twentieth century.

CHAPTER IV

"I THINK I'M THE ONLY ONE LEFT ALIVE WHO USED TO MINE THAT"[154]

The men and women who lived and worked on Calamity Mesa throughout the twentieth century endured a wide range of experience. Some miners lived and worked alone, while others had family and friends nearby. Most worked for big companies; a few maintained independent operations. But however varied their experience, they shared collective tragedies and collective joys which provide the social context for the uranium boom.

The population involved in mining on the Colorado Plateau consisted of two groups. Transient by nature, many of the men made up the last of the tramp miners, men who traveled from mine to mine, staying long enough for one or two paychecks.[155] Local residents moved onto the mesas to look for uranium as well, some taking their families along, others leaving them in town so their children could attend school. These residents provided a lasting presence on Calamity, Outlaw and the surrounding mesas. They lived and

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[154] Sherman Wagner, interview with author, Grand Junction, Colorado, 7 July 1990.

[155] Verne Bishop, interview with author.

worked there for many years, then retired to Grand Junction or somewhere nearby.

These two divergent groups came together to form nebulous communities. Isolated from extended family and friends, medical services, churches and schools, the people that lived on Calamity and Outlaw mesas banded together. They organized schools and a voting precinct, formed ladies groups, taught Sunday School, and cared for one another under all sorts of circumstances. These fluid communities provided a degree of humanity in a physical environment defined by isolated and difficult conditions. They also provided a support system in a working environment dominated by big impersonal businesses and the federal government. It was this working environment that eventually brought illness and death to many of those who participated.

One particular family provided much of the historical continuity in this corner of the Colorado Plateau. Since the first radium boom in the early twentieth century, there have been Fosters on Calamity and Outlaw mesas. John Foster, alias Peg Leg, began mining carnotite ore on Outlaw and Calamity in 1915. His two brothers, Julius and Russell, and his sixteen-year-old son, Ralph, worked beside him during the radium boom.[156] This family and their

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[156] Robert and Marjorie Foster, interview with author. Tales of claim jumping and outlaws survived this period and have been passed down in the Foster family. Peg Leg Foster was respected and feared throughout the area, as he was reputed to have killed a man in Paradox Valley, Colorado.

descendants remained involved in these mesas, mining through the series of ensuing booms and busts, until 1988.

From 1923 to 1925 a small rise in radium prices brought Ralph Foster back up to the mesa with his infant son, Robert. He leased some of the Calamity mines and worked them, especially Calamity #18. This period of activity was brief, but exposed Robert Foster to life on Calamity Mesa and foreshadowed a lifetime of work there.[157]

Julius Foster remained on Calamity Mesa after the radium boom ended. Living in the stone houses that some claim he helped build, Julius and his wife, Ella, served as company watchmen at the Calamity Camp. While mining remained unprofitable during this period, according to the 1872 mining law, yearly assaying work had to be done to maintain the claims. Charged with this responsibility by the various companies who owned the claims, Julius and Ella built roads by hand throughout the area to fulfill the assaying obligation. However, Julius suffered from silicosis due to previous years of mining and had only ten percent of his lung capacity. This left Ella to do most of the hard labor.[158] Although many friends from Gateway came to visit the couple, this period of the late twenties and

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[157] Robert Foster, interview with author.

[158] Ibid. Also, Rebecca Foster Zurek, interview with author, Grand Junction, Colorado, 8 August 1990.

early thirties was an inactive one on Calamity and Outlaw, leaving the mesas mostly deserted.[159]

However, a new generation of the Foster family soon established itself on the mesa. Robert Foster returned to Calamity and Outlaw in 1939 and 1940. After graduating from high school, Robert leased the claims on Calamity that his uncle had earlier sold to Union Carbide. This leasing agreement did not last long, and by 1942, Robert Foster was mining his own family claims on Outlaw Mesa. He married Marjorie Long, who had grown up helping her father mine.[160]

By the early forties, prospectors began to stream over the mesas of the Colorado Plateau looking for vanadium to aid the war effort. In 1943, Kenneth Hornbaker and his partner, Nelson Phillips, leased claims on Calamity Mesa and mined rich petrified trees, which had become saturated with carnotite ore. Hornbaker sold his peach farm in order to mine for vanadium, after his sons-in-law had been drafted to fight. Mining for the critical material was his way to contribute to the war, and bring his family members home quickly. His family remained in town, visiting him on the mesa on the weekends. His daughter, Floriene Rait, remembered her father's living conditions as primitive, but that he thought it was all a great adventure.

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[159] Eva Spencer, interview with author, Gateway, Colorado, 9 August 1990.

[160] Ethel Poage, Louise Warren, and Eva Spencer, interview with author, Gateway, Colorado, 9 August 1990.

In the mid-forties, the Atomic Energy Commission employed most of the people on Calamity Mesa. After a period of intense government exploration and drilling, the market again improved and miners began moving back onto the mesa, this time looking for uranium. Al C. Rinderle started working on Calamity in 1949. He had actively mined on Blue Creek mesa during the vanadium boom and moved over to Calamity while government crews still controlled the area. There were few roads on Calamity and even fewer miners.

When Climax acquired claims on Calamity Mesa, they contacted Al Rinderle. He brought needed experience to Climax Corporation's operation. Rinderle contracted with Climax in 1949 and remained with them until 1970. They provided him with equipment and a mine to work. He filled their ore trucks by hand, and ran the boarding house for the first miners. With the help of two young men, Rinderle dug all the inclines for the Arrowhead camp by hand.

With three shovels and a car, Rinderle and his small crew made more money on Calamity than on all of the other mines he had worked combined. He paid the two men every week, and provided them with room and board. His wife and his infant daughter lived there most of the time in a small cabin that Rinderle built. At first, the group lived off the land; later he went to Grand Junction every two weeks for supplies. He and his crew played poker at night, but mostly they worked. Climax provided Rinderle with operating

money. He built their camp into a profitable venture that would last until the late sixties.[161]

Ben and Madeline Zimmerman arrived on Calamity Mesa in 1948 and stayed for the next fifteen years. He contracted with Union Carbide, as did about five other men on Calamity, and sold ore for $4.00 per pound. Some of these miners lived in the stone houses, but the Zimmermans lived in a trailer. They pumped water out of Calamity creek and cooked with propane. Ben and Madeline raised five children there, and the children spent the summers playing, hunting, and searching for arrowheads. Ben, however, found little time for play. He worked most of the day in the mines, then often worked through the night setting off the explosives that enabled him to mine more ore.

By the mid-fifties, as the demand for uranium increased, a family could be found under nearly every cedar tree. Each of these families had their own generator for electricity and maintained a self-contained existence. The claims on Calamity demanded long work hours and this demand left little time for socializing with neighbors. As Ben Zimmerman stated, "Everybody was busy trying to make a dollar and get to town to spend it."[162]

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[161] Al C. Rinderle, interview with author, Grand Junction, Colorado, 11 July 1990.

[162] Ben and Madeline Zimmerman, interview with author, Grand Junction, Colorado, 10 July 1990.

In another trailer on Calamity Mesa resided Sherman and Dorothy Wagner and their children. He started mining on Calamity in 1949, leasing a mine from Earl Stuller. The Wagners lived farther away from the more populated area near the stone houses, but hauled their water up from the same creek. They did not own a propane refrigerator at first, so they hung fresh venison, which made up the bulk of their diet, outside every night.

Once a month, however, they came to town for supplies and a trip to the library for books. Saturday nights brought a few hours of "real electricity," and classical music on Dorothy's wind up phonograph. She recalled, "I would wind it up and put classical music on it, that was the only way there was music."[163] The Wagners survived mountain lions on the way to the outhouse and rattlesnakes around every corner, as did all of the families on Calamity.

Six families lived nearby on the mesa, and some of the men worked together, three to four miners at a time, in each mine.[164] They shipped the ore they mined to Uravan, the site of Union Carbide's mill.[165] The days were filled with

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[163] Dorothy Wagner and Susan Alexander, interview with author, Grand Junction, Colorado, 7 August 1990.

[164] Sherman Wagner, interview with author.

[165] It can be assumed from this that Earl Stuller must have leased or contracted these mines from Union Carbide, then hired his own contractors to work the mines.

hard work, but at night the Wagners went on picnics, and the children and their father fished and hunted all summer.

Climax's Arrowhead Camp grew during the fifties and sixties, as did Calamity Mesa in general. Outlaw Mesa also experienced growth during this period as the uranium boom progressed. Families came to the mesas, bringing trailers and school age children. As the population grew, people came together to organize schools and activities for those children.

The Fosters lived on Outlaw Mesa, all throughout this period, mining their family claims. Early on, however, from 1949-1953, Robert Foster leased Calamity #13, 17, and 18 from the Atomic Energy Commission, contracting through Union Carbide. As Foster worked those claims, as well as those on Outlaw, an association began between the people living on Calamity and the Fosters.[166]

Robert and Marjorie Foster, with members of Robert's family, mined uranium from 1940 until 1983. They hauled their own ore to the mills in Rifle, Uravan, and Grand Junction, and sold it directly to those mills. They had their own generators and water tanks, and moved from temporary trailers to a more permanent home as their family grew. The school was located near their home, as their family compound and the nearby Climax camp formed a central

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[166] Robert and Marjorie Foster, interview with author.

meeting place for the increasing number of miners on both Outlaw and Calamity.

Marjorie started the school in 1955. It began in an old tarpaper shack that had been left vacant by one of the miners. The first class had four members, Carol Cunningham, Lynn Forestburg, Rusty Liverman, and Sally Foster.[167] As the population grew on the mesas, so did the school, which included grades one through eight. Mrs. McFarlane was the first teacher at the Outlaw school. She moved to Outlaw Mesa from Cisco, Utah. Students, including the Wagner children, were bused from all over Calamity Mesa.[168]

A quonset building was erected on Outlaw to house the school, and it eventually held up to twenty students. The school had running water, thanks to nearby water tanks, and its own generator. It became the center of activity, with movies on Saturday night and church on Sunday morning. Marjorie Foster taught Sunday School on Outlaw Mesa every Sunday morning for nine years. A missionary would come to the mines once a month and stay with the Fosters, helping with the Sunday School and bringing students of a vacation bible school with him.[169]

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[167] Ibid.

[168] Dorothy Wagner and Susan Wagner Alexander, interview with author. The roads throughout the mesas and all over the Colorado Plateau had been improved as part of the AEC's procurement program.

[169] Robert and Marjorie Foster, interview with author.

As the population expanded on Calamity Mesa, a school opened there also. Linda Sterry attended that school the three years it operated, while her mother ran the boarding house at the Arrowhead Camp. This smaller school was also located in a quonset type building. Ten children, grades two through eight, attended the school from 1957 to 1959. There was no school bus for these children, so they all walked to and from school every day. They saw deer and rattlesnakes as they walked to school at eight o'clock and home again at three o'clock.

Mrs. Gertrude Day taught all grade levels at this school for two years, then moved to Outlaw when the Calamity school closed. Mrs. Day profoundly influenced the children she taught with the close personal attention and kindness she gave them. She had children come to her trailer after school, continuing to teach them on her own time. From her they learned not only reading, writing, and arithmetic, but also how to make candy, play the piano, and sew.[170]

Mrs. Day organized holiday activities for the children and their parents on both Calamity and Outlaw. On Halloween the students built a spook alley in the school out of materials they brought from their homes. Parents were invited, and many mothers came and were dutifully frightened. Children performed a nativity play every

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[170] Linda Sterry, interview with author, Grand Junction, Colorado, 29 August 1990.

Christmas that Mrs. Day taught on the mesas. Once Mrs. Day moved to Outlaw, Marjorie Foster took over the Christmas play, as Mrs. Day grew concerned about maintaining the separation of church and state, even in the tiny school on the mesa. The performances of the play were always big events on the mesas, and people came from all around to watch the children. Miners and their families packed the school to standing room only, year after year.[171]

While the men spent most of their time working in the mines, the women on the mesas banded together in the lonesome environment. Women worked hard on Calamity at a variety of chores. Some labored alongside their husbands, hauling ore and separating the high grade from the low. Others cooked and cleaned from dawn until dusk in the boarding houses, caring for twenty or more miners. In spite of this, many women found time in the afternoons to socialize with Marjorie Foster on Outlaw Mesa.[172]

The women on Calamity and Outlaw formed a bond to fight the isolation of their environment. They sewed, quilted and cooked. Mostly they talked with and cared for each other. Candy came out of the Foster kitchen for every occasion, and a baby quilt appeared for every new mother. The women cleaned each other's homes in times of trouble, and doctored

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[171] Robert and Marjorie Foster, Linda Sterry, and Dorothy Wagner, interviews with author.

[172] Robert and Marjorie Foster and Dorothy Wagner, interviews with author.

anyone who got hurt. Marjorie even helped deliver a child, to a mother who waited too long to get off the mesa.[173]

There were women who hated living on Calamity and Outlaw. It was, as Marjorie Foster stated, "a pretty lonesome place." But many of the women who lived there during the fifties kept in touch and have fond memories of the years they spent together. However, the fear of economic dislocation coupled with a new apprehension about physical health swept through the communities of hard-working miners and their families.

After 1959, mining on Calamity and Outlaw slowed down, as it did all over the Colorado Plateau. Linda Sterry remembered, "the mining kind of went and the people just started moving away."[174] The Calamity claims were spent and the Arrowhead camp began to dwindle. Outlaw remained strong for awhile, then eventually the school closed as more and more people left the area. Marjorie Foster had to spend winters in Grand Junction so her children could go to school, as did all the remaining families on the mesas.[175]

The 1960s found little mining on Calamity. Only the New Verde, located across the canyon from Calamity, remained fully operable. Bill Cohan arrived at the New Verde in 1956. He served as the company man on the site for Empire

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[173] Ibid.

[174] Linda Sterry, interview with author.

[175] Robert and Marjorie Foster, interview with author.

Star Mines. Empire Star Mines, a subsidiary of Neumont Mines, acquired the New Verde from Union Carbide. Cohan worked as a mining engineer and geologist, overseeing the mine and keeping track of the mine costs.[176]

A sizeable crew lived in the camp at the New Verde. The crew consisted of two mechanics, a top man who supervised the comings and goings of the mine, and a variable number of miners. The operation peaked in 1957, with close to twenty men living in the camp. The company provided a boarding house for the single miners, and families brought in trailers. Cohan slept in his office, which was located right above the portal of the mine. The children who lived in this camp attended the Calamity school, and it was proposed that Cohan drive the school bus to and from Calamity every day. Bill Cohan went into Grand Junction every ten days for supplies, and this routine, plus the daily management of the mining crew and the mine itself, kept him busy.

The master mechanic employed at the New Verde was Charlie Cunningham. His wife, trained to be a mechanic during World War II, served as the other on-site mechanic. The two often argued over exactly what a problem was and how to fix it when dealing with an old temperamental compressor, which operated the drills in the mine. The camp at New

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[176] Bill Cohan, interview with author, Grand Junction, Colorado, 8 August 1990.

Verde and those living on Calamity drew their water from the same source, Calamity Creek. The Union Mines Development Company developed the spring during their exploration on the mesa. The two camps struck an agreement as to when each could draw water, and when that agreement was not upheld, words flew across the gulch.[177]

Most of the miners employed at the New Verde were considered tramp miners. These men worked for one or two pay periods, then moved on to other mines. From 1956 to 1957, Calamity and Outlaw were very active districts, and men rotated between the mines located there. While working at the New Verde, the miners received three meals a day for $1.50, and boarded in a bunkhouse that had running showers. The miners worked in nine-hour shifts, eight hours in the mine, one hour out at lunch. During the peak period, the miners worked in two shifts. The first began at 7:00 a.m., the second began at 4:30 p.m. A thirty-minute lag time between shifts allowed all the blasting to be done for the next crew.

The New Verde was the largest mine operating on Calamity Mesa throughout the 1950s and 1960s. By 1957, the tunnel ran 2600 horizontal feet into the side of the hill. The New Verde closed down not long after its peak years of 1956 and 1957. However, it was one of the few mines on the

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[177] Ibid.

Colorado Plateau that was re-opened and worked periodically throughout the 1970s.

However, most of the mining that went on on Calamity and Outlaw mesas occurred before 1960. Thus most of the miners who worked there did the greater part of their work before the federal government and the mining companies began warning the miners of the danger involved in mining uranium.

Many miners later felt that experts at many levels knew the miners were at great risk from exposure to high levels of radiation in the uranium mines. History suggested that this kind of mine presented a considerable risk to the miner. In 1952, a United States Public Health Service report stated that European miners in Czechoslovakia and Germany who had worked in uranium-bearing mines suffered from damaged lungs. Fifty to seventy percent of all the workers in these mines died of some kind of radiation-related disease.[178] Three times in the late forties and early fifties, inspectors from various government agencies visited the mines in the Colorado Plateau region. Independent physicians, working with the Department of Public Health, also started watching for cases of lung cancer in the uranium miners. Dr. Geno Saccomanno came to the Colorado Plateau in 1948 looking for uranium miners to

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[178] "Experts Knew Miners Were at Great Risk," High Country News, 18 June 1990.

develop lung cancer.[179] These inspectors reached the same conclusions: radon levels in the mines were potentially hazardous. The solution to this health risk seemed relatively simple; better ventilation in the mines.[180]

From 1950 forward, the United States Public Health Service conducted regular physical examinations of the men employed in the uranium mining industry, but neglected to tell the miners why they were being examined. The federal government did not enforce restrictions at any level, since the power to regulate the private mining companies involved fell to the individual states.[181]

By the late 1950s, however, articles began appearing in the newspapers about the radiation risk.[182] The miners also became more and more suspicious, as the government and companies monitored their health through regular on-site physicals. During 1959, the uranium industry increasingly began to implement measures to guard against radiation hazards. The companies determined that these hazards came from three general sources: excessive concentrates of radon and its daughter products in the air of uranium mines, excessive quantities of airborne uranium dust in milling

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[179] Dr. Geno Saccomanno, interview with author, Grand Junction, Colorado, 9 July 1990.

[180] Ibid.

[181] Charles F. Thomas, "Mining Uranium in the Colorado Plateau," The Explosives Engineer (Nov-Dec 1954): 182.

[182] Grand Junction Daily Sentinel, 18 August 1955.

operations, and radium and other contaminants in the liquid discharged from uranium mills into river or other water systems.[183]

Radioactive radon gas and the short-lived decay products, radon daughters, seeped from the rock face of uranium mines and evaporated from running water. These radon daughters then became attached to dust particles in the mine and were breathed in by the miners. Once in the lungs, this material caused alpha radiation effects to the cells of the lungs' lining.[184]

Scientists developed the system of measuring radon daughters in terms of working levels in the early 1950s. This enabled researchers to determine at what levels the radiation became harmful to the miners. Dr. Geno Saccomanno, of St. Mary's hospital in Grand Junction, received a government grant to conduct a controlled study of the mining population for evidence of increased cases of lung cancer in 1956.[185] Between 1957 and 1987, he collected sputum samples for cytologic analysis from an estimated

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[183] Anthony M. Mastrovich, "A Review of the Uranium Industry," American Mining Congress Journal (Feb 1960): 106.

[184] Geno Saccomanno, Gerald C. Huth, Oscar Auerbach, and Marvin Kuschner, "Relationship of Radioactive Radon Daughters and Cigarette Smoking in the Genesis of Lung Cancer in Uranium Miners," Cancer 62 (October 1988): 1402.

[185] Dr. Geno Saccomanno, interview with author.

16,720 uranium miners who were actively mining uranium on the Colorado Plateau during that same period.[186]

Dr. Saccomanno and his assistants monitored the miners through their sputum samples once a year. If a miner showed any abnormality, Dr. Saccomanno would shorten this interval to every six months, then as often as treatment required. Through this study Dr. Saccomanno determined that an approximately twelve-year latent period existed between the time of exposure and the advent of lung cancer. He also developed the key technology for earlier detection of lung cancer that increased the success of treatment of this cancer.[187]

The federal government and mining companies cooperated with Dr. Saccomanno's study in the late fifties as overall awareness of the danger of radiation increased. Attention began to be paid to the risks of cigarette smoking, and smoking histories were kept on the miners. Uranium miners were relatively heavy smokers -- 76% of the miners smoked versus 39% in the non-mining population.[188] A strong connection evolved between cigarette smoking and radiation. The two carcinogens combined to cause a significant increase in lung cancer. Dr. Saccomanno stated:

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[186] Saccomanno, Huth, Auerbach, and Kuschner, 1403.

[187] Dr. Geno Saccomanno, interview with author.

[188] Saccomanno, Huth, Auerbach, and Kuschner, 1404.

> We conclude that the effects of accumulated radiation exposure in the uranium miner population has [sic] caused an increase in lung cancers, especially in accumulated exposures of over 300 working level months, and has caused a decrease in the average age at which lung tumors develop. Cigarette smoking is also implicated in the increased incidence of lung cancer in this population. It is considered the primary cause of all lung cancers developed at radiation levels under 300 working level months.[189]

Ventilation of the mines emerged as the solution to the problem of intensive radiation. However, ventilating the numerous mines on the plateau was expensive and much time passed before many of the mines were made safe. Prior to 1960, miners were exposed to "horrendous" doses of radiation.[190] It was only after 1971 that the federal government passed a law limiting radon-daughter exposure.[191] Although many of the miners involved during this period subsequently died from lung cancer, those who survived into the 1990s remembered the lack of information available to them.

Robert Foster received his high level of radiation exposure in the old claims on Calamity Mesa. These mines had never been ventilated for any reason, as they had always been worked by hand. All of the mines there were very dry, causing a large of amount of dust to be present in the air. Foster remembered, "Carbide had a safety engineer that went

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[189] Ibid., 1406.

[190] Dr. Geno Saccomanno, interview with author.

[191] Saccomanno, Huth, Auerbach, and Kuschner, 1402.

into the mine, a week later we could still smell his pipe smoke."[192] The Fosters did not use explosives or any power equipment in these mines, and thus did not ventilate them for this reason. The family mines on Outlaw, however, were ventilated. The Fosters used diesel engines to run their drills and other mining equipment. The diesel fumes that permeated the mines necessitated ventilation.[193] Although Union Carbide sent a safety engineer to inspect the old mines on Calamity, the company never informed the Fosters of the potential risk involved in mining in an unventilated mine. However, after 1960, companies compensated miners for ventilating mines as a part of the claim development.

Ben Zimmerman just assumed that Union Carbide knew what it was doing, in spite of the rumors circulating about the hazards lurking in the uranium mines. The first six years on Calamity, he worked in very dry mines without any ventilation. He heard of the physicals being performed on the miners at the larger mines, but the small operators were not tested.[194]

Sherman Wagner, however, related the feelings of the surviving miners the most poignantly.

> They didn't tell us there was any danger in uranium mining. You could tell when it was high pitchblende ore. That ore smelled different--

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[192] Robert and Marjorie Foster, interview with author.

[193] Ibid.

[194] Ben and Madeline Zimmerman, interview with author.

> burned your eyes. I think I am the only one left alive that used to mine that. For a long time the government had a Dr. Saccomanno call in every two or three months. I should have been smart enough to know that there was something wrong with mining then--but when you got three kids and a wife, you don't think of things like that too well.[195]

The men and women who lived and worked on Calamity and Outlaw mesas struggled for existence. None of them became millionaires, none of them found the one big mine that enabled them to retire. Most of them were paid by the ton, for the ore they produced, which reduced their labor to piecework. Because they were paid by the piece and not for their time, the miners worked long days and often through the night to try and make a living.[196]

This type of labor system greatly reduced the threat of labor organization. The companies encouraged competition between the miners and fostered their independence. This kept the miners from organizing against the companies. The men and women on Calamity and Outlaw were independent, and worked too hard to stay on the edge of financial stability to take time out to organize. The company removed the threat of organization even further by maintaining the miners' status as contractors or lease-holders.

This system also kept them from being considered company employees, thus removing any liability from the

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[195] Sherman Wagner, interview with author. Pitchblende was the type of rich ore found in the Belgian Congo, and in various spots on the Colorado Plateau.

[196] Ben and Madeline Zimmerman, interview with author.

company for workmen's compensation or health insurance. Thus the miners were left on their own when injured in a mine accident or when they developed life-threatening disease. This abandonment by both the federal government and the companies became even more painfully clear as many of the miners died from lung cancer with no compensation for the survivors. Only in 1990, after most of the miners were gone, did the government take responsibility for what happened on the Colorado Plateau.

CONCLUSION

The rustic stone houses remained standing on Calamity Mesa throughout the years of mining booms and busts in the twentieth century. The buildings sheltered generations of miners and their families, through prosperity and poverty. Calamity Mesa was, in the words of an Atomic Energy Commission official, "kind of the cradle of the whole thing."[197] It was one of the few areas in the vast Colorado Plateau region that experienced all three major carnotite booms. The history of the search for radium, vanadium, and uranium was indelibly connected to that mesa and the people that lived there.

The economic mining of the sandstone ore, carnotite, for uranium and vanadium could not have been established before the turn of the century. There was no profitable market for the ore and its products. The development of this mining industry was controlled not only by the isolated and inaccessible geography of the area, but also by world production and world politics throughout the twentieth century.[198]

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[197] Don Hill, interview with author, Grand Junction, Colorado, 30 August 1990.

[198] "Uranium Exploration," 6.

The United States government and major mining companies also played a critical role in the development of the area. While the initial mining boom of the 1910-1920 period evolved with limited interference from the government, several companies gained ownership of the Calamity Mesa claims from the individual prospectors who first discovered the ore. The United States government became increasingly involved during the vanadium boom, as the mineral was designated by President Franklin D. Roosevelt as critical to the nation's defense. With the discovery of the power of the atom, the United States government became even more intimately involved in the Colorado Plateau and the search for uranium, specifically on Calamity Mesa. For those who mined during the 1950s, the nation's defense depended on successful mining ventures.

The men and women who lived on Calamity and the surrounding mesas battled for existence during each of these periods. Financial security was not easily achieved, though with the advent of each boom period, the miners' hopes rose. Calamity Mesa saw no instant millionaires or extravagant individual fortunes. The first miners dealt with claim jumpers, an unstable market, and expensive and uncertain transportation methods. The radium boom brought rugged and fiercely competitive individuals to Calamity, with their burros, shovels, and dreams of riches. But by 1925, as the market began to stabilize, their dreams were ended by the

discovery of richer and more accessible ore in the Belgian Congo. Most of the miners sold out to mining companies that had the capital necessary to exploit and survive.

The vanadium boom in the late thirties brought another generation of miners to Calamity Mesa. However, this group had to deal with increasing company and government interference. The claims were already owned and controlled, so the opportunity to establish individually owned mining operations was nearly non-existent. Although the atmosphere was not as free from outside constraints as it was during the first boom, the men and women on the mesa felt that perhaps this boom would end their long awaited for and coveted personal prosperity.[199] By the end of that mining period, men and women were working on the mesa for nothing but food and shelter. During those years of intense economic depression, many felt lucky to even get that.

The advent of World War II helped the economy on the Colorado Plateau, as it did most of the nation. The demand for uranium became critical in the early forties, but due to the top secret nature of the Manhattan Project, independent miners were not included in this market. The uranium ore used for the development of atomic weapons came primarily from company stockpiles of vanadium tailings. Ironically, the men and women who had struggled to mine this ore during the late thirties were paid only for its vanadium content,

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[199] Shumway, 91.

not for the better-paying uranium content. The value of uranium was neither known nor appreciated. The federal government did not encourage independent producers during this period, as the government felt that only large private companies could provide the quantity of ore necessary. These companies, most notably Union Carbide, were easily controlled by the government, and in a way, controlled the government through the awarding of lucrative federal contracts.

After the end of World War II, the Cold War gave mining on the plateau an air of urgency. The government told the miners, the companies, and the press that their activities were crucial for the nation's defense. The Colorado Plateau blossomed under the influence of what one source described as the first "government promoted, government supported, and government controlled mineral rush in American history."[200]

In this period of patriotic fervor and suspicions concerning encroaching communism, the miners on the mesas worked in dangerous--even life-threatening--conditions to provide a uranium stockpile for the country. Their activities were dictated by major mining companies through a system of labor that kept them struggling for existence and unable to organize to improve their situation. Even if they had been able to organize, in the 1950s the country as a whole may have viewed them as un-American.

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[200] Husband, 20.

While the companies refused to give their contract miners employee status, Union Carbide built a company town for its mill workers at Uravan. The town had a baseball diamond, swimming pool, commissary, theater, school and post office. About six hundred United States Vanadium Company employees and their families lived there in company housing. The typical mill employee at Uravan received a health and accident insurance plan, a savings plan, paid vacation and a pension.[201] The miners, in contrast, were left to their own devices in times of injury or illness and had no access to pension, savings, or workingmen's compensation plans.

The men and women on Calamity Mesa confronted this situation, determined to earn a living and provide a better life for their children. They worked long hours, often day and night, year around, to try and mine enough ore to prosper. Taking a vacation was not possible. Men and women worked side by side, as wives assisted their husbands by sorting and loading the ore onto waiting ore trucks. Both husband and wife were often employed on the mesa to make enough money to support their families. Women ran boarding houses, cooked, and cleaned; and in at least one case, a women worked as a mechanic in a mine.[202]

The history of mining on the Colorado Plateau geographically told these working-class people that the

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[201] Verne Bishop, interview with author.

[202] Bill Cohan, interview with author.

employment on the mesa would not be permanent. At best, it was cyclical. By 1957, many of the miners had moved off the mesa to look for other work. Some of the miners relocated in other, more productive mining areas, while others moved back into Grand Junction and other towns. However, during the 1950s, a semblance of a community appeared and evolved on Calamity Mesa.

It was this community that helped the miners and their families survive the harsh world of contract labor and radiation exposure. The Fosters, through their continued presence and warm nature, offered social contact for many people. Because this contact existed, the isolation of the mesas did not seem quite as unbearable to the men and women who lived there. They gathered to watch their children perform in plays or musicals, to gossip about local events and people, to sew quilts for one another, and most importantly, to care for each other in times of accident or illness. They watched fireworks on the fourth of July, voted in November, and kept track of national and world events through radios and occasional trips to Grand Junction. They certainly lacked many comforts, but they thrived on human interaction.

Without this sense of community, the men and women on Calamity Mesa would have existed with little hope for themselves or their children. No one person struck it rich there, as some did in Moab, Utah, and other locations

throughout the plateau. The claims were too old, had been heavily mined for decades by the 1950s, and were owned by corporate entities. People moved through the mesas constantly, moving on to look for richer veins of ore, more benevolent employers, or some secure position. Only those same sandstone houses remained on Calamity Mesa. The Fosters remained on Outlaw Mesa for a time, but the other miners left. This one family and the five remaining stone structures serve as reminders of the long history of the area, as well as the deadly consequences of mining for uranium there.[203]

During the critical mining period of the 1950s, the federal government was very anxious to stockpile uranium, regardless of the cost.[204] Uranium miners, mill workers, soldiers, and numerous civilians exposed to radioactivity from contact with ore or nuclear weapons tests "were sacrificed to serve the national security interests of the United States."[205] For many years the government refused to accept responsibility for the high rates of cancer that

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[203] Compiling statistics on the number of people who died from working specifically on Calamity was made impossible due to the lack of company records listing the names of all the men and women who worked there. However, more important to this study is the perception of those men and women who have lived into the 1990's. All of those interviewed overwhelmingly felt that almost everyone who had mined on Calamity and Outlaw had died of lung cancer.

[204] Dr. Geno Saccomanno, interview with author.

[205] "Experts Knew Miners Were at Great Risk," High Country News, 18 June 1990.

occurred in these exposed populations. The companies involved in uranium mining also refused to accept responsibility for the many incidents of lung cancer in uranium miners. That is one reason for contract labor rather than employee status. The companies did not have direct responsibility to non-employees.

For over thirty years the federal government fundamentally ignored the plight of the uranium miners. However, in June of 1990, congress passed the Radiation Exposure Compensation Act. This act established a $100 million trust fund to compensate those miners who worked in uranium mines between 1947 and 1971, and those people who were exposed to radiation from atomic bomb testing from 1943 to 1963.[206] The official formal apology issued by the federal government to all those affected by radiation exposure was much more meaningful to many miners and other victims than the monetary compensation provided for by the act. The federal government finally accepted blame for the many deaths that occurred as a result of uranium mining on the Colorado Plateau.

Those individuals who lived and worked on Calamity Mesa survived both an extremely harsh natural environment and dangerous working conditions. They bonded together in a world designed to keep them apart. The federal government became fully involved in uranium mining with an extremely

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[206] Grand Junction Daily Sentinel, 10 June 1990.

complicated organization and complex price schedules and rules. The complicated nature of the government's involvement served to keep the miners uninformed and sometimes underpaid. The contract system of labor set up by the major mining corporations encouraged the miners to compete against one another, and company officials hoped that this would occur. Neither the government nor the corporations involved encouraged community development on the mesas of the Colorado Plateau. The work environment was too transient and dangerous.

Yet those who lived on Calamity and Outlaw helped each other in times of accident and illness, and socialized when times were good. Those who lived on the mesa filled in where the mining companies that controlled much of their lives fell short. Working to establish their own community and improve their quality of life, the working men and women on Calamity Mesa found their own kind of individual worth and internal prosperity, in spite of the mining companies, the federal government, and the world that demanded the materials of destruction.

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Oral Interviews

These interviews were funded in part by the Grand Junction, Colorado Office, Bureau of Land Management. They will be deposited with the Museum of Western Colorado, Grand Junction, Colorado and the Grand Junction Public Library, Grand Junction Colorado. All interviews were conducted by Lisa Pitcher Godfrey.

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APPENDIX

CALAMITY MESA GROUP IS COMPLETE, 1949 - 1989.
INCLUDES VCA PRODUCTION AT THE NEW VERDE BEFORE 1971

Production records provided by Umetco Minerals Corporation, P.O. Box 1029, Grand Junction, Colorado 81502.

JUL-90

AREA OR GROUP	CLAIM NAME	DEPL. GRP	GRP. NO.	CLAIM NO.	YEAR	DRY-TONS	U3O8 POUNDS	V2O5 POUNDS	% U3O8	% V2O5	V2O5:U3O8 RATIO
CALAMITY MESA	CALAMITY LEASE	200	200	0.0	1953	71.41	219.33	957.51	0.15	0.67	4.37
CALAMITY MESA	CALAMITY 1	200	200	2.0	1949	145.49	862.16	5126.21	0.30	1.76	5.95
CALAMITY MESA	CALAMITY 1	200	200	2.0	1950	336.15	1602.46	9360.33	0.24	1.39	5.84
CALAMITY MESA	CALAMITY 1	200	200	2.0	1951	50.64	479.30	2767.06	0.47	2.73	5.77
CALAMITY MESA	CALAMITY 1	200	200	2.0	1957	254.71	1540.00	8836.34	0.30	1.73	5.74
CALAMITY MESA	CALAMITY 1	200	200	2.0	1958	147.35	877.28	4573.95	0.30	1.55	5.21
CALAMITY MESA	CALAMITY 1	200	200	2.0	1959	198.69	1850.39	7227.87	0.47	1.82	3.91
CALAMITY MESA	CALAMITY 2	200	200	3.0	1949	98.84	126.62	3136.60	0.06	1.59	24.77
CALAMITY MESA	CALAMITY 2	200	200	3.0	1950	869.47	2883.40	27478.86	0.17	1.58	9.53
CALAMITY MESA	CALAMITY 2	200	200	3.0	1951	394.86	3307.18	16615.80	0.42	2.10	5.02
CALAMITY MESA	CALAMITY 5	200	200	5.0	1951	46.72	202.61	1396.14	0.22	1.49	6.89
CALAMITY MESA	CALAMITY 6	200	200	6.0	1954	989.91	11624.49	31133.46	0.59	1.57	2.68
CALAMITY MESA	CALAMITY 6	200	200	6.0	1955	3602.08	19034.51	85483.17	0.26	1.19	4.49
CALAMITY MESA	CALAMITY 6	200	200	6.0	1956	562.89	4002.72	12448.13	0.36	1.11	3.11
CALAMITY MESA	CALAMITY 6	200	200	6.0	1959	190.68	1672.21	6093.18	0.44	1.60	3.64
CALAMITY MESA	CALAMITY 7	200	200	7.0	1956	470.80	2877.12	9504.80	0.31	1.01	3.30
CALAMITY MESA	CALAMITY 8	200	200	8.0	1958	12.91	188.51	578.44	0.73	2.24	3.07
CALAMITY MESA	CALAMITY 9	200	200	9.0	1949	110.00	854.57	3391.08	0.39	1.54	3.97
CALAMITY MESA	CALAMITY 9	200	200	9.0	1958	69.49	269.48	1072.01	0.19	0.77	3.98
CALAMITY MESA	CALAMITY 10	200	200	10.0	1958	47.06	298.15	1212.34	0.32	1.29	4.07
CALAMITY MESA	CALAMITY 10	200	200	10.0	1959	2048.91	9825.60	40842.12	0.24	1.00	4.16
CALAMITY MESA	CALAMITY 10	200	200	10.0	1960	411.87	1785.25	8417.48	0.22	1.02	4.72
CALAMITY MESA	CALAMITY 13	200	200	12.0	1950	972.58	6432.97	26942.34	0.33	1.39	4.19
CALAMITY MESA	CALAMITY 13	200	200	12.0	1951	528.72	7517.07	20327.38	0.71	1.92	2.70
CALAMITY MESA	CALAMITY 13	200	200	12.0	1952	380.20	5599.81	17329.42	0.74	2.28	3.09
CALAMITY MESA	CALAMITY 13	200	200	12.0	1954	712.28	7693.15	20077.80	0.54	1.41	2.61
CALAMITY MESA	CALAMITY 13	200	200	12.0	1955	221.80	1113.54	4601.86	0.25	1.04	4.13
CALAMITY MESA	CALAMITY 13	200	200	12.0	1956	375.18	2310.24	7385.82	0.31	0.98	3.20
CALAMITY MESA	CALAMITY 13	200	200	12.0	1957	25.81	220.62	586.91	0.43	1.14	2.66
CALAMITY MESA	CALAMITY 14	200	200	13.0	1952	235.96	2705.53	7303.45	0.57	1.55	2.70
CALAMITY MESA	CALAMITY 14	200	200	13.0	1953	393.39	4014.84	12138.09	0.51	1.54	3.02

CALAMITY MESA GROUP IS COMPLETE, 1949 - 1989
INCLUDES VCA PRODUCTION AT THE NEW VERDE BEFORE 1971

Jul-90

AREA OR GROUP	CLAIM NAME	DEPL GRP.	GRP NO.	CLAIM NO	YEAR	DRY-TONS	U3O8 POUNDS	V2O5 POUNDS	% U3O8	% V2O5	V2O5:U3O8 RATIO
CALAMITY MESA	CALAMITY 14	200	200	13.0	1954	855.75	9411.23	36107.85	0.55	2.11	3.84
CALAMITY MESA	CALAMITY 14	200	200	13.0	1955	319.59	2904.80	10838.18	0.45	1.70	3.73
CALAMITY MESA	CALAMITY 14	200	200	13.0	1956	85.98	507.99	2693.44	0.30	1.57	5.30
CALAMITY MESA											
CALAMITY MESA	CALAMITY 15	200	200	14.0	1953	243.16	3893.82	12980.71	0.80	2.67	3.33
CALAMITY MESA	CALAMITY 15	200	200	14.0	1956	12.29	63.93	346.68	0.26	1.41	5.42
CALAMITY MESA	CALAMITY 17	200	200	15.0	1950	1138.88	11658.59	41192.64	0.51	1.81	3.53
CALAMITY MESA	CALAMITY 17	200	200	15.0	1951	1324.25	8156.91	44558.27	0.31	1.68	5.46
CALAMITY MESA	CALAMITY 17	200	200	15.0	1952	779.47	5294.23	24703.36	0.34	1.58	4.67
CALAMITY MESA	CALAMITY 17	200	200	15.0	1953	2494.04	15839.48	65046.67	0.32	1.30	4.11
CALAMITY MESA	CALAMITY 17	200	200	15.0	1954	1150.58	6680.54	31879.13	0.29	1.39	4.77
CALAMITY MESA	CALAMITY 17	200	200	15.0	1957	48.94	581.50	1742.02	0.59	1.78	3.00
CALAMITY MESA	CALAMITY 17	200	200	15.0	1958	111.21	2031.58	4763.06	0.91	2.14	2.34
CALAMITY MESA	CALAMITY 18	200	200	16.0	1949	360.83	1905.23	8676.88	0.26	1.20	4.55
CALAMITY MESA	CALAMITY 18	200	200	16.0	1950	384.12	2687.45	11268.11	0.35	1.47	4.19
CALAMITY MESA	CALAMITY 18	200	200	16.0	1956	589.64	1949.20	9486.39	0.17	0.80	4.87
CALAMITY MESA	CALAMITY 18	200	200	16.0	1957	393.16	1338.91	6304.72	0.17	0.80	4.71
CALAMITY MESA	CALAMITY 20	200	200	17.0	1952	281.00	1953.35	8486.34	0.35	1.51	4.34
CALAMITY MESA	CALAMITY 20	200	200	17.0	1953	25.10	323.34	1378.64	0.64	2.75	4.26
CALAMITY MESA	CALAMITY 20	200	200	17.0	1954	319.33	1624.38	8872.78	0.25	1.39	5.46
CALAMITY MESA	CALAMITY 20	200	200	17.0	1957	210.91	1723.48	5017.72	0.41	1.19	2.91
CALAMITY MESA	CALAMITY 20	200	200	17.0	1958	378.95	2953.53	10492.07	0.39	1.38	3.55
CALAMITY MESA	CALAMITY 21	200	200	18.0	1949	109.81	528.99	3765.75	0.24	1.71	7.12
CALAMITY MESA	CALAMITY 21	200	200	18.0	1950	1278.17	10337.11	45242.22	0.40	1.77	4.38
CALAMITY MESA	CALAMITY 21	200	200	18.0	1951	1480.12	11632.21	45436.80	0.39	1.53	3.91
CALAMITY MESA	CALAMITY 21	200	200	18.0	1952	858.90	9395.13	37209.12	0.55	2.17	3.96
CALAMITY MESA	CALAMITY 21	200	200	18.0	1953	1698.65	11105.45	48673.36	0.33	1.43	4.38
CALAMITY MESA	CALAMITY 21	200	200	18.0	1954	1453.39	11738.33	45373.47	0.40	1.56	3.87
CALAMITY MESA	CALAMITY 21	200	200	18.0	1955	2181.66	16439.44	61583.92	0.38	1.41	3.75
CALAMITY MESA	CALAMITY 21	200	200	18.0	1956	961.66	6438.33	29989.08	0.33	1.56	4.66
CALAMITY MESA	CALAMITY 21	200	200	18.0	1957	1867.76	13593.87	63724.95	0.36	1.71	4.69
CALAMITY MESA	CALAMITY 21	200	200	18.0	1958	315.56	4289.86	18122.68	0.68	2.87	4.22
CALAMITY MESA	CALAMITY 23	200	200	20.0	1953	176.04	787.14	3376.73	0.22	0.96	4.29
CALAMITY MESA	CALAMITY 27	200	200	24.0	1949	16.37	108.02	504.12	0.33	1.54	4.67
CALAMITY MESA	CALAMITY 27	200	200	24.0	1950	2196.58	17576.68	79694.11	0.40	1.81	4.53

CALAMITY MESA GROUP IS COMPLETE, 1949 - 1989
INCLUDES VCA PRODUCTION AT THE NEW VERDE BEFORE 1971

JUI-90

AREA OR GROUP	CLAIM NAME	DEPL GRP.	GRP. NO.	CLAIM NO.	YEAR	DRY-TONS	U308 POUNDS	V205 POUNDS	% U308	% V205	V205:U308 RATIO
CALAMITY MESA	CALAMITY 27	200	200	24.0	1951	1155.82	6397.62	32225.69	0.28	1.39	5.04
CALAMITY MESA	CALAMITY 27	200	200	24.0	1952	1139.95	6503.27	27984.70	0.29	1.23	4.30
CALAMITY MESA	CALAMITY 27	200	200	24.0	1953	1304.31	10530.57	40734.70	0.40	1.56	3.87
CALAMITY MESA	CALAMITY 27	200	200	24.0	1954	1127.36	7994.64	33332.18	0.35	1.48	4.17
CALAMITY MESA	CALAMITY 27	200	200	24.0	1955	1758.33	13667.65	51375.04	0.39	1.46	3.76
CALAMITY MESA	CALAMITY 27	200	200	24.0	1956	2327.05	20598.06	77831.90	0.44	1.67	3.78
CALAMITY MESA	CALAMITY 27	200	200	24.0	1957	1463.17	11371.54	52142.40	0.39	1.78	4.59
CALAMITY MESA	CALAMITY 27	200	200	24.0	1958		17.71			ERR	0.00
CALAMITY MESA	CALAMITY 27	200	200	24.0	1959	536.99	4580.21	18469.65	0.43	1.72	4.03
CALAMITY MESA	CALAMITY 28	200	200	25.0	1958	39.73	854.06	2054.60	1.07	2.59	2.41
CALAMITY MESA	DIXIE	200	200	27.0	1949	73.47	1000.05	2829.13	0.68	1.93	2.83
CALAMITY MESA	DIXIE	200	200	27.0	1955	120.35	851.18	3397.13	0.35	1.41	3.99
CALAMITY MESA	DIXIE	200	200	27.0	1956	1377.02	9195.37	45943.94	0.33	1.67	5.00
CALAMITY MESA	DIXIE	200	200	27.0	1957	567.52	3317.15	17724.16	0.29	1.56	5.34
CALAMITY MESA	DIXIE	200	200	27.0	1958	85.38	415.98	2320.19	0.24	1.36	5.58
CALAMITY MESA	GREAT HESPER	200	200	28.0	1952	380.01	3758.23	14398.80	0.49	1.89	3.83
CALAMITY MESA	GREAT HESPER	200	200	28.0	1958	74.43	1632.29	4419.93	1.10	2.97	2.71
CALAMITY MESA	GREAT HESPER	200	200	28.0	1959	14.07	284.22	872.37	1.01	3.10	3.07
CALAMITY MESA	HIDDEN TREASURE	200	200	29.0	1949	193.28	995.21	4588.32	0.26	1.19	4.61
CALAMITY MESA	HIDDEN TREASURE	200	200	29.0	1950	997.87	7069.61	28768.85	0.35	1.44	4.07
CALAMITY MESA	HIDDEN TREASURE	200	200	29.0	1951	1197.27	5870.63	33954.61	0.25	1.42	5.78
CALAMITY MESA	HIDDEN TREASURE	200	200	29.0	1952	291.16	1514.22	8207.65	0.26	1.41	5.42
CALAMITY MESA	HIDDEN TREASURE	200	200	29.0	1953	419.38	4335.06	14703.51	0.52	1.75	3.39
CALAMITY MESA	HIDDEN TREASURE	200	200	29.0	1954	1232.62	9222.99	30746.32	0.37	1.25	3.33
CALAMITY MESA	HIDDEN TREASURE	200	200	29.0	1955	122.64	932.93	3689.34	0.38	1.50	3.95
CALAMITY MESA	HIDDEN TREASURE	200	200	29.0	1956	211.17	837.30	3427.73	0.20	0.81	4.09
CALAMITY MESA	HIDDEN TREASURE	200	200	29.0	1957	72.14	393.07	1512.22	0.27	1.05	3.85
CALAMITY MESA	HUMMER	200	200	30.0	1957	61.67	345.84	2089.67	0.28	1.69	6.04
CALAMITY MESA	LUCKY BOY	200	200	32.0	1956	468.86	4777.03	21591.06	0.51	2.30	4.52
CALAMITY MESA	LUCKY BOY	200	200	32.0	1957	865.05	8144.44	34496.43	0.47	1.99	4.24
CALAMITY MESA	LUCKY BOY	200	200	32.0	1958	413.05	4812.55	18262.63	0.58	2.21	3.79
CALAMITY MESA	LUCKY BOY	200	200	32.0	1959	304.66	3557.36	16406.25	0.58	2.69	4.61
CALAMITY MESA	MATCHLESS	200	200	34.0	1949	501.06	14059.50	62561.46	1.40	6.24	4.45

CALAMITY MESA GROUP IS COMPLETE, 1949 - 1989.
INCLUDES VCA PRODUCTION AT THE NEW VERDE BEFORE 1971

JUL-90

AREA OR GROUP	CLAIM NAME	DEPL GRP	GRP NO	CLAIM NO	YEAR	DRY-TONS	U3O8 POUNDS	V2O5 POUNDS	% U3O8	% V2O5	V2O5:U3O8 RATIO
CALAMITY MESA	MATCHLESS	200	200	34	0 1950	1535.75	23317.47	109534.51	0.76	3.57	4.70
CALAMITY MESA	MATCHLESS	200	200	34	0 1951	1066.13	22196.47	115084.87	1.04	5.40	5.18
CALAMITY MESA	MATCHLESS	200	200	34	0 1952	1887.75	45531.77	205242.74	1.21	5.44	4.51
CALAMITY MESA	MATCHLESS	200	200	34	0 1953	2901.21	31548.54	129187.51	0.54	2.23	4.09
CALAMITY MESA	MATCHLESS	200	200	34	0 1954	1044.97	8104.56	47437.52	0.39	2.27	5.85
CALAMITY MESA	MATCHLESS	200	200	34	0 1955	351.84	5029.63	26604.15	0.71	3.78	5.29
CALAMITY MESA	MATCHLESS	200	200	34	0 1956	438.20	8467.74	47109.45	0.97	5.38	5.56
CALAMITY MESA	MATCHLESS	200	200	34	0 1957	148.23	799.95	4300.32	0.27	1.45	5.38
CALAMITY MESA	MATCHLESS	200	200	34	0 1958	310.90	3802.45	20820.10	0.61	3.35	5.48
CALAMITY MESA	MATCHLESS	200	200	34	0 1959	288.54	1955.47	7994.10	0.34	1.39	4.09
CALAMITY MESA	MAYDAY	200	200	35	0 1952	312.79	4686.75	12045.78	0.75	1.93	2.57
CALAMITY MESA	MAYDAY	200	200	35	0 1957	14.24	79.73	415.73	0.28	1.46	5.21
CALAMITY MESA	NEGLECTED	200	200	36	0 1951	1482.46	27140.84	75272.94	0.92	2.54	2.77
CALAMITY MESA	NEGLECTED	200	200	36	0 1952	541.63	4556.92	21073.24	0.42	1.95	4.62
CALAMITY MESA	NEGLECTED	200	200	36	0 1955	23.12	504.07	1327.24	1.09	2.87	2.63
CALAMITY MESA	NEGLECTED	200	200	36	0 1957	74.32	160.86	845.03	0.11	0.57	5.25
CALAMITY MESA	QUEEN OF THE HILLS	200	200	38	0 1951	18.92	339.57	1170.47	0.90	3.09	3.45
CALAMITY MESA	QUEEN OF THE HILLS	200	200	38	0 1952	1007.91	10578.38	38610.44	0.52	1.92	3.65
CALAMITY MESA	QUEEN OF THE HILLS	200	200	38	0 1953	1621.36	14829.53	60849.40	0.46	1.85	4.10
CALAMITY MESA	QUEEN OF THE HILLS	200	200	38	0 1954	1828.98	13705.52	60040.84	0.37	1.64	4.38
CALAMITY MESA	QUEEN OF THE HILLS	200	200	38	0 1955	2456.65	12482.86	64783.73	0.25	1.32	5.19
CALAMITY MESA	QUEEN OF THE HILLS	200	200	38	0 1956	1370.21	8788.22	41665.45	0.32	1.52	4.74
CALAMITY MESA	QUEEN OF THE HILLS	200	200	38	0 1957	1636.35	5559.40	40514.28	0.17	1.24	7.29
CALAMITY MESA	QUEEN OF THE HILLS (E)	200	200	38	1 1958	1033.05	4489.50	21903.38	0.22	1.07	4.88
CALAMITY MESA	SUNFLOWER	200	200	39	0 1949	77.25	411.61	2358.00	0.27	1.53	5.73
CALAMITY MESA	SUNFLOWER	200	200	39	0 1950	995.89	4598.84	26286.14	0.23	1.32	5.72
CALAMITY MESA	SUNFLOWER	200	200	39	0 1951	453.18	1794.91	11867.18	0.20	1.31	6.61
CALAMITY MESA	SUNFLOWER	200	200	39	0 1952	361.69	1468.59	10470.88	0.20	1.45	7.13
CALAMITY MESA	SUNFLOWER	200	200	39	0 1957	14.38	51.76	290.45	0.18	1.01	5.61
CALAMITY MESA	SUNFLOWER	200	200	39	0 1958	263.73	1397.33	4709.70	0.26	0.89	3.37
CALAMITY MESA	TRIUMPH	200	200	42	0 1956	325.81	2715.32	10812.52	0.42	1.66	3.98
CALAMITY MESA	TRIUMPH	200	200	79	0 1949	93.17	356.56	1791.97	0.19	0.96	5.03
CALAMITY MESA	TRIUMPH	200	200	88	0 1952	54.56	1159.12	2545.50	1.06	2.33	2.20

CALAMITY MESA GROUP IS COMPLETE, 1949 - 1989
INCLUDES VCA PRODUCTION AT THE NEW VERDE BEFORE 1971

JUL-90

AREA OR GROUP	CLAIM NAME	DEPL. GRP.	GRP. NO.	CLAIM NO.	YEAR	DRY-TONS	U308 POUNDS	V205 POUNDS	% U308	% V205	V205:U308 RATIO
CALAMITY MESA	TRIUMPH	200	200	229.0	1952	8.42	60.59	313.06	0.36	1.86	5.17
CALAMITY MESA	NEW VERDE, V.C.A. PRODUCTION THROUGH				1970	67000.00	428800.00	1956400.00	0.32	1.46	
CALAMITY MESA	NEW VERDE, TIN HORN	6 2517	2251	146	1971	258.72	1142.90	6487.99	0.22	1.25	5.68
CALAMITY MESA	NEW VERDE, TIN HORN	1 2517	7708	701	1972	645.90	3222.80	16510.76	0.25	1.28	5.12
CALAMITY MESA	NEW VERDE, TIN HORN	1-8	7708	701	1975	215.37	761.36	3430.58	0.18	0.80	4.51
CALAMITY MESA	NEW VERDE, TIN HORN	1-8	7708	701	1976	1790.32	9285.93	44271.90	0.26	1.24	4.77
CALAMITY MESA	NEW VERDE, TIN HORN	1-8	7708	701	1977	1377.45	6178.65	26084.28	0.22	0.95	4.22
CALAMITY MESA	NEW VERDE, TIN HORN	1-8	7708	701	1979	694.52	2772.27	13726.38	0.20	0.99	4.95
CALAMITY MESA	NEW VERDE, TIN HORN	1-8	7708	701	1980	4487.89	15513.27	77877.78	0.17	0.87	5.02
CALAMITY MESA	NEW VERDE, TIN HORN	1-8	7708	701	1981	4888.54	22363.09	107527.42	0.23	1.10	4.81
CALAMITY MESA	NEW VERDE, TIN HORN	1-8	7708	701	1982	778.19	3033.50	14006.70	0.19	0.90	4.62
CALAMITY MESA	NEW VERDE, SOFTHORN	2517	7708	702	1973	1922.64	9301.50	44016.33	0.24	1.14	4.73
CALAMITY MESA	NEW VERDE, BULLHORN	2 2517	2251	16	1971	664.33	3745.82	18470.31	0.28	1.39	4.93
CALAMITY MESA	NEW VERDE, POWDERHORN	2517	2251	103	1971	11118.55	55254.33	295234.52	0.25	1.33	5.34
CALAMITY MESA	NEW VERDE, BULLHORN, E	2517	7708	703	1972	2740.01	13960.15	64154.42	0.25	1.17	4.60
CALAMITY MESA	NEW VERDE, BULLHORN, ETC.		7078	703	1977	5976.43	32124.39	155245.21	0.27	1.30	4.83
CALAMITY MESA	NEW VERDE, BULLHORN, ETC.		7078	703	1978	4079.34	16904.54	90052.60	0.31	1.10	5.33
CALAMITY MESA	NEW VERDE, BULLHORN, ETC.		7078	703	1979	2220.87	7641.89	38673.13	0.17	0.87	5.06
	*** GROUP TOTAL ***					198868.20	1375959.80	6144389.41	0.35	1.54	4.47