

Carroll College

Mining in Montana:

The Economic, Social, and Environmental Impacts on

Communities

An Honors Thesis Submitted to

the Department of Political Science

By

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This thesis for honors recognition has been approved
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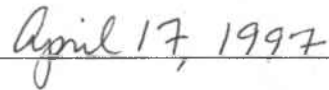
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Preface

Mineral extraction was one of the foundations on which Montana was built. Mining operations helped to attract people to Montana, which eventually would lead to its statehood. Mining attracted other industries, such as ranching and farming, and provided funding for schools, theaters, museums, libraries, and other cultural advantages. Mining was the industry of Montana, and was expected to last forever.

However, over time, mining operations lost their popularity due to their negative social, economic, and environmental impacts on communities. Pollution and waste from both old, abandoned and operating mines caused damage to the environment, and threatened the health of individuals living in mining communities.

The boom-bust economy associated with the mining industry proved to be detrimental to communities relying solely on mining for its economic base. Mines took resources and people from communities with no promise for the future once they had mined out an area and moved on.

Mining operations do not attract the most savory people. Therefore, mining operations proved to be socially damaging to a community, bringing in higher rates of crime and lower character standards to the community.

However, there are others who hold a different view of the mining industry. Rather than experiencing economic, social, and environmental decline, many mining communities actually experience an increase in social well-being, environmental improvement, as well as economic gain. Significant efforts have been made by the mining industry in recent years to improve the state of the environment. Capital

accumulated has been invested differently in communities to sustain them rather than destroy them. And finally, while still unstable, new technological advances in mining operations have increased the longevity of mines.

Both sides of the issue present arguments that illustrate their beliefs. Therefore, it is hard to determine who is right and who is wrong, or even if that can be determined. Do mines actually benefit, rather than detract from a community? Are the social, economic, and environmental impacts a mine has on a community positive or negative? Can the impacts a mine have on a community be stereotyped and measured in qualitative terms?

Hopefully, through published research and a case study conducted in a mining community, some level of measurement of the impacts mining has on a community economically, socially, and environmentally can be assessed.

Introduction

Mineral extraction has been a part of trade for well over a thousand years, providing direct and indirect income for people for the same length of time. Minerals have been used for currencies, jewelry, tools, and more recently, in electronics and electricity. Without mineral extraction, our civilization would not have advanced and reached the level it has in the modern age.¹

Mineral extraction has built cities, and in Montana's case, helped to build an entire state, bringing in people and attracting other industries supported by mineral extraction. Montana welcomed thousands of immigrants from Croatia, and Slovenia, and other European countries, providing them with a means of making a better living than they ever dreamed of having in their native land. Mineral extraction also attracted large amounts of out of state investment, as well as providing Montana cities with cultural opportunities.²

However, the mining industry created future problems that were not predicted. The first significant problem presently facing the mining industry is the degradation that past mining caused to the environment. Since the dawning of environmental awareness, mining operations have had to change the way in which they operate, following new restrictions and policies. It is questionable, however, whether the regulations are strict enough and if the mining operations are indeed following them.³

¹ Montana Environmental Quality Council. (1996). "Water Quality." Our Montana Environment...Where do We Stand?. p. 25.

² Helena Board of Trade. (1878). "Report of the Secretary of the Helena Board of Trade, Territory of Montana." Broadway, Helena: Fish Brothers, Herald Steam Print. p. 2.

³ Smith, Duane A. (1989 Winter). "On the Move Again: Hard Rock Mining in the West." Montana: The Magazine of Western History. p. 10.

Though the mining industry is known for paying its employees excellent salaries, it is also criticized for being an unstable industry. Mines are no longer open for the long periods of time they used to be. The average length of time for a mine to operate is five years. Mine employees with families move frequently. Relocation of these families takes resources from the community instead of adding to it.⁴

Economic instability can lead to social instability. Some critics of mining have observed that mining does not always attract the most desirable people. A successful, prosperous community relies on solid, responsible members who are willing to contribute their time and effort to make it function.⁵

These criticisms of mining operations have led to the question of whether mining, as it has been in the past, is a reliable economic and social resource for Montana's communities. Another consideration is whether the mining industry really is working to protect the environment, or is still ruthlessly mining for a profit without any regard to the future.

Determining whether mining is going to benefit Montana's communities in the 1990's is difficult to consider without the whole picture. Therefore, a brief historical summary of the mining industry's role in Montana's development will be presented, followed by an examination of the environmental, economic, and social issues surrounding the mining industry. A case study featuring the TVX Mineral Hill Mine in Gardiner, Montana will illustrate the economic, social, and environmental impact that mining has on a community.

⁴ Power, Thomas Michael. (1996). Lost Landscapes and Failed Economies: The Search for a Value of Place. Washington, DC: Island Press. p. 98.

Chapter I

Mineral Extraction's History in Montana

The Rush

“Montana's foundation, like that of many other western states, stands on a golden cornerstone.”⁶ Montana was an unsettled frontier until gold was discovered by James and Granville Stuart and Reece Anderson in the spring of 1858. These three men found placer deposits at Gold Creek, which is located east of the small, present-day town of Drummond. In the summer of 1862, James and Granville Stuart, as well as others, were busy mining for gold.⁷ As a result of the gold discovery at Gold Creek, a small settlement sprang up. It was called American Fork, but did not live long, for as soon as the gold was gone, so were the people.⁸

By mid-1862, the Montana gold rush was in full bloom. Prospectors from California and Colorado made their way north to strike it rich. Immigrants from Croatia, Slovenia, Ireland, and other countries flooded in from their native lands hoping to strike it rich. They were all drawn by the news of John White's placer claim in the Montana territory. White discovered a significant amount of gold at Grasshopper Creek. As a result of this discovery, Montana birthed its first “boomtown”, a place called Bannack City.⁹

⁵ Ibid. p. 99.

⁶ Ibid. p. 98

⁷ Malone, Michael P. et.al. (1991). Montana: A History of Two Centuries. Seattle: University of Washington Press. p. 64.

⁸ Ibid. p. 65.

⁹ Ibid. p. 65.

Bannack's population increased rapidly. By the fall of 1862, Bannack had five hundred inhabitants. As expected in any gold town, it operated on a first come, first serve basis. As a result, gold prospectors spread throughout the Missouri drainage, staking claims in Horse Prairie Creek which is located 15 miles west of Bannack, and Prickly Pear Creek which is located to the north of Bannack. Yet, for all the wealth they produced, these two claims were minute in comparison to the load found at Alder Gulch, located seventy miles east of Bannack.¹⁰

The placer deposit discovered at Alder Gulch brought in hundreds of miners looking for gold. In little more than a year and a half later, over ten thousand miners swarmed around the area looking for their riches. Virginia City and Nevada City were the result. Virginia City became one of the richest, most famous gold camps of the West, as well as the center of activity for Montana. In a five year period, an estimated thirty to forty million dollars was taken out of the gulch. The next significant discovery was made in July 14, 1864 at Last Chance Gulch, located at "the geographic center of Montana's mining region."¹¹ Last Chance Gulch soon became the permanent settlement of Helena. The city's location and the estimated nineteen million dollars taken from Last Chance Gulch in four years established Helena as a permanent settlement.¹²

Mineral Extraction Communities

People from the Eastern part of the United States rushed to the Montana Territory with the hope of discovering gold. As the population grew, territorial leadership was

¹⁰ Ibid. p. 65.

¹¹ Ibid. p. 67.

established. Territorial leaders recognized that the influx of people was due to the attraction of riches from mineral extraction. As the population grew, territorial leadership was attraction of riches from mineral extraction. Territorial and community leaders determined that mineral extraction needed to be protected and promoted. Organizations, such as the Helena Board of Trade, were established with their primary focus being to protect and promote mineral extraction.¹³

The Helena Board of Trade was established in 1887. Its members believed mineral extraction promoted the general welfare of the citizens of the Montana Territory, providing excellent personal income as well funding for cultural functions and education. Board members declared to the world that Montana's mineral resources were permanent and inexhaustible.¹⁴

People of all ethnic backgrounds were drawn to mining because it paid excellent wages and required no formal education. Poor, uneducated immigrants could make as much as \$20 to \$30 per day. This was a considerable sum of money for the mid to late 1800's. Croats, Slovenians, Irish, Orientals, and people of other ethnic groups traveled to the Montana Territory to work for mining companies.¹⁵ This allowed for diversity in mining settlements, but also for extreme racism and discrimination. Thus, by

¹² Ibid. p. 67.

¹³ Helena Board of Trade. (1878) "Report of the Secretary of the Helena Board of Trade, Territory of Montana." Broadway, Helena: Fish Brothers, Herald Steam Print. p.1.

¹⁴ Ibid. p. 16

¹⁵ Zelic, Anna. (1990 Spring). "Fire in the Hole: Slovenians, Croatians, and Coal Mining on the Musselshell." Montana: The Magazine of Western History. p. 21.

1900, most Orientals and other minority groups moved back to the Pacific Coast or back to their native lands.¹⁶

Mining camps were diverse not only ethnically, but also in commercial activities. Mineral wealth attracted merchants, freighters, carpenters, saloon-keepers, religious-leaders and people from other service sectors. Residents of mining communities thrived, bringing with them cultural and social activities from other communities. Miners enjoyed the novelty of affordable theater. Acting troupes, some famous, others completely unknown, traveled to mining camps. It was not only financially rewarding for the actors, but served as a feeder for their artistic egos.¹⁷

Immigrant miners also established fraternal lodges, churches, and traditional community activities.¹⁸ Libraries were also established, and a membership was required for their use. The Helena Library Association was well funded, with several hundred members paying \$5 per year for membership fees.¹⁹

American and immigrant men, with families flooded into the Montana Territory. Most of these immigrants and Americans could not afford to go to school when they were younger, but still valued education. Consequently, parents provided funds to build schools and provided wages for a school teacher to teach their children.²⁰ Some immigrants, more specifically Croats, established private, Catholic schools that not only

¹⁶ Malone, Michael P., ed. (1991). Montana: A History of Two Centuries. Seattle: University of Washington Press. p. 85.

¹⁷ Kershner, William R. (1988 Spring). "The Best Attractions at Popular Prices: Early Theater in Butte." Montana: The Magazine of Western History. p. 29.

¹⁸ West, Elliot. (1988 Winter). "Child's Play: Tradition and Adaptation on the Frontier." Montana: The Magazine of Western History. p. 9.

¹⁹ Emmons, David. (1995 July 13). "Expert Report for the State of Montana VS Atlantic Richfield Company, No. CV-83-317-HLN-PGN." United States District Court, District of Montana, Helena Division. p. 32.

provided academic instruction, but religious and moral instruction. With their large salaries, miners were able to provide their children with the education they could not have themselves.²¹

However, for all the cultural and educational benefits a mining operation provided for a community, there were also, as in any community, negative impacts.

Some miners were transients, a group of people with little civic pride and interest in community welfare. These people led to a corrupt and inefficient local government because the federal government, which was usually far behind on the development of all the little gold camps, had no jurisdiction. Therefore, once a gold camp or town had been established, a town meeting was held among the miners in order to establish a “mining district” and provide basic laws. Montana's gold towns were populated by a significant number of people who had joined the California gold rush and had already had experience with establishing laws and local governments to keep peace and order in their towns. These early local governments were democratic in nature, and proved later on to be inadequate. Montana resorted to vigilantism, which served as the law from mid 1863 until March of 1867. At that time, Montana established official territorial courts and a law system to deal with illegal activity.²²

²⁰ West, Elliot. (1988 Winter). “Child’s Play: Tradition and Adaptation on the Frontier.” Montana: The Magazine of Western History. p. 10.

²¹ Zelic, Anna. (1990 Spring). “Fire in the Hole: Slovenians, Croatians, and Coal Mining on the Musselshell.” Montana: The Magazine of Western History. p. 29.

²² Malone, Michael P., ed. (1991). Montana: A History of Two Centuries. Seattle: University of Washington Press. p. 79.

Mineral Extraction Economy

Montana was known as “The Treasure State” as early as the late 1870’s. Its vast mineral treasures, which were considered inexhaustible, were a source of pride for the Montana Territory. Large amounts of minerals equaled large quantities of money. Montana Territory’s, and later Montana State’s, leaders believed that increased money circulation led to increased money supply and elasticity. They also believed that increased money circulation led to lower interest rates, which would enhance domestic tranquillity.²³ Therefore, with this concept in mind, it is understandable why Montana’s leaders would value the \$750,000,000 collected from the export of gold, silver, copper, and lead between 1862 and 1899. In 1899 alone, Montana mined \$68,457,307.54 in gold, silver, copper, and lead. The demand for minerals was high, and as technological advancements were made, the demand for minerals increased.²⁴

In 1891, John W. Eddy provided an apt description of Montana’s mineral resources that reflected the popular opinion of the time:

No other State, or region of equal extent, can show so many mining camps of acknowledged richness and permanency as Montana; and in this connection, it should be remembered that long before we had the means of developing to such an extent as to establish the character of our mines, other mineral regions had already received the benefits which their proximity to the channels of commerce had rendered easily procurable. It is not very long since Montana was regarded as an inaccessible region in the distant fastnesses of the great rocky barriers of the arid Northwest, and because of this it was difficult to bring our wonderful mineral wealth to the notice of capitalists.²⁵

²³ Emmons, David. (1995 July13). “Expert Report for the State of Montana Vs Atlantic Richfield Company No. CV-83-317-HLN-PGN.” United States District Court, District of Montana, Helena Division. p. 30.

²⁴ Calderhead, J.H.(Commissioner), Holmes, Oliver M. (Chief Clerk). (1890 November 30). Seventh Report of the Bureau of Agriculture, Labor, and Industry for the State of Montana. Helena, Montana: Independent Publishing Company: State Printers and Binders, 1900. p. 24.

²⁵ Eddy, John W. (1891). Its Past, Present, and Future. 21 Bailey Block, Helena, Montana: Arthur Wide and W.D. Rumsey. p. 43.

Thus, mining was not only perceived as being profitable and inviting to outsiders, but also as being permanent and stable.²⁶

Businesses in towns indirectly profited from mineral extraction operations. These businesses provided goods and services to miners. Ranchers and farmers settled around mining settlements in order to profit from providing miners and business owners with fresh vegetables, milk, eggs, beef, lamb, and pork. With advancements made in mining technology, more businesses relied directly on mining activity for their own profitability.²⁷

Mineral extraction was the fuel of industrialized society. It provided not only Montana with capital, but the entire nation. By 1915, the common belief was that “the development of mineral resources is of nation-wide value and the promotion of their best use properly...a national duty.”²⁸ Mining was recognized as being an important component for development, not only for Montana, but for the entire West.

Environmental Concerns of Mineral Extraction

In 1900, John Boyle, the State Inspector of Mines, knew that the tailings of the Silver Bow Mine were well over capacity. However, Inspector Boyle believed that jobs were more important than clean water. This is one of the earliest documented concerns for the future environment. Yet, it was not until 1947 that the State of Montana passed

²⁶ Ibid. p.43.

²⁷ Malone, Michael P., ed. (1991). Montana: A History of Two Centuries. Seattle: University of Washington Press. p. 13.

laws concerning water conditions. Before this awakening of environmental concern, the State of Montana “encouraged mining- openly and without apology.”²⁹

Concern for the environment continued to grow, until finally in 1974, the Montana State Legislature amended Article IX of the Constitution of Montana. Article IX, the Environment and Natural Resource section, had five goals after its amendment: “1) Protection and improvement, 2) Reclamation, 3) Water rights, 4) Cultural resources, and 5) Severance tax on coal and the coal trust fund.”³⁰ This change in the State Constitution changed the role of mining in Montana, and opened a clear path for environmentalists to demand that mining operations shift their focus from extracting valuable minerals to preserving the environment.

The environment, unlike one hundred years ago, now plays a significant role in mineral extraction. Mineral extraction help to build Montana, but can it continue to sustain it? Increased environmental awareness has increased the costs for mining operations.³¹ Can mining operations continue to operate profitably and still preserve the environment?

²⁸ Emmons, David M. (1995 July 13). “Expert Report for the State of Montana VS Atlantic Richfield Company, No. CV-83-317-HLN-PGN.” United States District Court, District of Montana, Helena Division. p. 31.

²⁹ Ibid. p. 34.

³⁰ Montana State Legislature (1975). The Constitution of Montana. Helena, Montana: State Capitol. p. 20, 21.

³¹ Smith, Duane A. (1989 Winter). “Hard Rock Mining in the West.” Montana: The Magazine of Western History. p. 10.

Chapter II

Environmental Impacts

Water Quality

“Water quality is a necessity of life.”³² Water is the life source for so many important parts of peoples' lives. For economic, health and recreational reasons, clean water is a necessity. Ranchers and farmers need clean water for their livestock and crops. Clean water is needed to produce healthy uncontaminated crops, as well as animals who live to maturity for reproduction and meat.³³

City dwellers and rural inhabitants alike need clean water for their daily lives: for drinking, cleaning, yard maintenance, swimming pools, etc. Recreationists, such as fishermen and people involved in water sports, need clean water. Fishermen would like to catch healthy and edible fish, and water recreationists would like to be in water without having to worry about being poisoned by toxic chemicals.³⁴

It is only logical to expect water quality to decline and organisms to be killed by toxic waste contamination from mining activity. However, while it is known that pollutants are harmful to the environment, it is often difficult to determine their impact due to different variables in the mining operations.³⁵

³² Montana Environmental Quality Council. (1996). “Water Quality”. Our Montana Environment...Where do We Stand?. Montana Environmental Quality Council. p. 20.

³³ Ibid. p. 20.

³⁴ The National Audubon Society. (1996 September-October). “Montana: Cleaner Water.” Audubon. p. 18.

³⁵ Ledin, M. and Pedersen, K. (1996, October). “The Environmental Impact of Mine Wastes Rose in their Significance in Treatment Of Mine Wastes.” Earth-Science Reviews, 41. 68.

Pollutants of various types affect water quality, but the most significant cause of water quality depredation in Montana is acid mine drainage (AMD). Acid production does not occur in all operations because it is normally associated with sulfide-bearing metallic ores, such as pyrite, pyrrhotite, chalcopyrite, sphalerite, marcasite, and arsenopyrite. AMD results from the exposure of the sulfide-bearing metallic ores to air and it is increased when water enters the mine from external sources. The majority of water seeping into the mine is from natural watercourses. However, some of the water may be used for transporting "mill tailings underground for the purposes of backfilling excavations and for processing and servicing needs."³⁶ The composition of underground drainage waters has been estimated to be approximately 51 percent from natural watercourses, 14 percent from mine backfill (where it is used), 34 percent from service and process sources, and 1 percent from other unknown sources.³⁷

The average total amount of watering flowing into an underground mine is estimated at 1000 liters a minute, and pumping must continue in order to ensure the running of the mine. After the water is pumped through the mine, the water usually contains significant amounts of highly toxic dissolved minerals. This drainage water is impounded at the surface before discharge and recycling. Water purification is normally used at this point in a sequential approach, where the use of one pond or several ponds is implemented in order to allow the settling out of the solids contaminating the water.

³⁶ Sengupta, M. (1993). Environmental Impacts of Mining: Monitoring, Restoration, and Control. London: Lewis Publishers. p. 17.

³⁷ Ibid. p. 18.

Additional treatment of the water running from the impoundment is done in order to neutralize acids and remove heavy metals and radioactive materials.³⁸

However, before contaminated water can be treated, it is often the case that water is depleted through seepage, percolation, runoff, and evaporation.³⁹ Percolation is when contaminated water that is stored in tailings impoundments is absorbed downward into the soil.⁴⁰ Seepage, from a tailings impoundment, is the movement of contaminated water through soil without definite channels, and evaporation is when water vaporizes and becomes a part of the atmosphere. It is through these methods that untreated, contaminated water is released into the environment before waste discharge.⁴¹

The determining factors of how water is lost from tailings impoundments depends upon two variables. Knowing the location of the mine within the localized drainage basin and the positions of its interconnecting watercourses can help mining specialists deduce how contaminated water would be lost.⁴² Water loss before discharge plays a moderate role in pollution, overridden by the actual effects of discharge from the mine. The type of materials discharged from the mine have a tremendous impact on the environment. Dissolved chemical materials are capable of being transported miles away from the discharge point. As a result, the water quality of a large area is affected. However, solid

³⁸ Ibid. p. 18.

³⁹ Down, C.G. and Stocks, J. (1978). Environmental Impacts of Mining. London: Applied Science Publishers Limited. p.95.

⁴⁰ Merritt, Roy D. (1986). Coal Exploration, Mine Planning, and Development. Park Ridge, New Jersey: Noyes Publications. p. 377.

⁴¹ Ibid. p.391.

⁴² Sengupta, M. (1993). Environmental Impacts of Mining: Monitoring, Restoration, Control. London: Lewis Publishers. p. 18.

wastes are usually deposited right out of the discharge point and affect only the immediate areas around them.⁴³

Acid mine drainage, however, is a problem that can be predicted and then prevented. Acid-base accounting analyses can be conducted on the ore and other minerals during the exploration stages of mining to determine whether acid drainage is going to be a problem with a particular mine site.⁴⁴ Once the acidity of the site is determined, a plan to control it is formed. There are basically three stages of acid-generation. The first stage is the control of the acid-generation process. The initial components of the acid-generation process are wastes containing reactive sulfide, oxygen, and water. Acid generation is influenced by bacterial activity, temperature, and pH level. The goal of acid-generation control is to stop or reduce the rate of acid formation at the earliest possible stage by inhibiting sulfide oxidation. Acid generation can be controlled by removing the primary components of acid generation or by manipulating the environmental factors at the source. Yet, this is an expensive and lengthy process. Some mines do not comply with regulations that prevent AMD because the added cost and time are not profitable.⁴⁵

Control over acid generation can be realized in five ways. Removing sulfide or isolating it is the first solution. When sulfide minerals in waste rock and tailings are separated by coating, then the sulfide-oxidation-producing acid will not result. Another method of preventing acid generation from occurring is the exclusion of water. Water excluded from the acid-generation process includes surface water, infiltration due to

⁴³ Ibid. p. 18.

⁴⁴ Ibid. p. 178.

precipitation, and groundwater seepage. Water sources vary according to the type and location of the waste containment area. Groundwater seepage is the current problem in underground mines. However, the primary concerns for waste rock dumps and tailings deposits are surface water and infiltration.⁴⁶ Removing water completely would solve this problem, but it is impractical because though water can be stopped by synthetic, impermeable barriers, water will eventually break through the synthetic barrier to create acid-generation. Excluding oxygen would stop the oxidation of sulfide minerals or decrease the rate of contamination. Lowering the levels of oxygen to an extremely low level can be done by placement of a cover with “an extremely low oxygen diffusion characteristic.” Materials that have this characteristic are soil, water, and synthetic material.⁴⁷ Acid-generation can be controlled by maintaining the pH of water within the alkaline range. Alkaline materials can be added to prevent acid-generation from occurring. The last and final means of preventing acid-generation from occurring is control of bacterial action. Bacterial control compounds are used to reduce the presence of bacteria in waste piles.⁴⁸

The primary focus of acid-generation control measures is to protect the environment in the most cost-effective way. Control measures are determined by several factors. The first factor is the degree of acid-producing potential of the mine waste. This includes the nature, quantity, and reactivity of sulfide present, as well as the neutralizing potential of the rock. The second is the physical characteristics of the waste; the third is

⁴⁵ Ibid. p. 182.

⁴⁶ Ibid. p. 182

⁴⁷ Ibid. p. 183.

⁴⁸ Ibid. p. 183.

the climate, topography, surface and groundwater patterns, the fourth is the “expected time period over which the measure will be effective,” and finally, the fifth is the “sensitivity of the receiving environment to acid mine drainage.”⁴⁹

There is no doubt that acid drainage is detrimental to the environment. However, there seems to be great concern from members of the mining industry with keeping acidic material out of the water. Concern for their public reputation and avoiding fines from environmental degradation have compelled mining companies to keep acidic material out of the water. Several ways of neutralizing the effects of acid drainage have been utilized by mining companies in order to protect the most valuable resource existing on earth.⁵⁰

While acid mine drainage is the most important contributor of chemical pollution of water from mining activities, the most common impact of mining to water quality in Montana is nonpoint source drainage, better known as erosion and subsequent sedimentation. Erosion, in relation to mining operations, is a process by which solids are removed from their original location by storm water runoff from mining operation facilities such as haul roads, waste disposal sites, and placer mining, as well as orebodies.⁵¹ The effects of pollution of nonpoint source drainage vary, depending upon the design of the mining facility, the orebody, and the geographical setting. It is from these factors that the impact of nonpoint source drainage can be assessed.⁵²

Nonpoint source impacts on water quality are the most common form of pollution caused by mining operations. Nonpoint sources cause sedimentation, changes of

⁴⁹ Ibid. p. 184.

⁵⁰ Holmes, Hannah. (1994 May). “How to Prepare for an Environmental Audit.” Safety and Health, 149. 57.

⁵¹ Sengupta, M. (1993). Environmental Impacts of Mining: Monitoring, Restoration, Control. London: Lewis Publishers. p. 316.

background pH level, alteration to the biota community, reduction to beneficial uses, and introduction of heavy metals or toxic substances.⁵³ In surface water resources, sedimentation is considered to be the most common source of nonpoint pollution.

Erosion, combined with sedimentation, impacts surface waters by smothering stream bottoms. The combination also extinguishes aquatic insects and spawning gravels, plugs up intergravel spaces inhabited by immature fish, degrades facilities for water-based recreation, increases industrial and domestic water treatment costs, and jeopardizes water quality.⁵⁴ Impacts on water quality attributed to sedimentation alone are increases in nitrogen and phosphorous compounds. They prematurely age the lakes because these chemical compounds induce algae growth, destroy crops, and reduce productivity of floodplain soils, temperature, pH, and oxygen supply in the water.⁵⁵

It is evident that erosion and sedimentation have a dramatic affect on water quality. However, there are solutions to the problem. During exploration, several physical factors have to be taken into consideration. The contributing drainage area size, the slope, the flow velocity, the plant cover, and the soil scour velocity need to be considered when developing a plan to prevent erosion and sedimentation.⁵⁶ Special attention must be given to soil composition and geological conditions. Factors to be considered are the depth to bedrock, depth to water table, soil classifications, grain size gradations, permeability, available water capacity, pH reactions, shrink-well potential, and moisture-density. After these initial considerations, more specific assumptions can

⁵² Ibid. p. 317.

⁵³ Ibid. p. 317.

⁵⁴ Ibid. p. 317.

⁵⁵ Ibid. p. 317.

⁵⁶ Ibid. p. 317.

be made on what the soil can support development-wise. These considerations include topsoil suitability, the possibility of pipeline construction and maintenance, locations for roads and highways, sites for ponds and reservoirs, urban development, dikes and levees, construction of drainage and irrigation systems, terraces and diversions.⁵⁷

After taking these considerations in hand, it is possible to stabilize erosion and prevent sedimentation from occurring. When implementing control measures, the dissection of drainage patterns, the reduction of flow velocity, and “disperse runoff toward sediment control sites” must be considered. The overall goal is to implement long-range and interim drainage control measures.⁵⁸

Best management practices (BMPs) are developed in order to control nonpoint source pollution. Plans should focus on interim and longitudinal water management planning. “An effective surface-drainage water management plan incorporates interim drainage stabilization for erosion control with reclamation activities.” Careful planning in the preliminary stages of mineral development helps to solve many problems that occur when the future of the environment is not taken into account.⁵⁹

Water quality is too important to people and the environment to let its condition decline.⁶⁰ Future generations depends upon water’s continued quality for their existence. There are obvious problems that have to be dealt with, and mining companies are working to provide solutions. Companies face “...an ever-increasing burden of ensuring that their activities are conducted in an environmentally responsible and sensitive fashion,

⁵⁷ Ibid. p. 284.

⁵⁸ Ibid. p. 317.

⁵⁹ Ibid. p. 317.

⁶⁰ Montana Environmental Quality Council. (1996). “Water Quality.” Our Montana Environment...Where do We Stand? Montana Environmental Quality Council. p. 20.

and of educating the public about the progress that has been made in implementing sound environmental management techniques.⁶¹ However, water is not the only segment of the environment drastically affected by mining.

Wildlife

Due to their wilderness locations, mines usually raise concerns among environmentalists about the impacts of mining operations on different species of wildlife. The impact that mining has on the environment begins at the exploration level. Noise pollution attributed to low-flying aircraft disturbs wildlife and the grid exploration method leaves large, visible scars in the wilderness. Grid exploration not only disturbs wildlife, but also causes erosion and can have long-term effects on watercourses. However, the largest contributor to wildlife disturbance, in any development as well as in a mining operation, is transportation.⁶²

Other than noise, the other impact transportation has on wildlife is the construction of highways and railways. The impact roads have on wildlife depends upon the density of traffic on the highways at all times. Roads built in remote wilderness areas affect the habitat of game animals. Game animals such as moose, sheep, elk, and deer have additional hunting pressures put on them with increased access to wilderness areas.⁶³

⁶¹ Chiaro, Preston S. (1994 August). "Overcoming Environmental Roadblocks: Costly, but Necessary." American Mining Congress Journal, 80. 7.

⁶² Ripley, Earle A. et.al. (1996). Environmental Effects of Mining. Delray Beach, Florida: St. Lucie Press. p.13.

⁶³ Rumble, Mark A. (1989 September). Wildlife Associated with Scoria Outcrops: Implications for Reclamation of Surface-Mine Lands. Colorado State University. p. 1.

Populations of fish are affected by road development because fishermen have greater access to remote areas.⁶⁴

Chemical contamination from mining activity disturbs wildlife beginning with the lowest level. Chemical contaminants destroy the food chain, beginning with basic plant life that is eaten by phytoplankton, which are eaten by fish, which then feed birds or small mammalian carnivores, such as otters or other small animals. These small mammalian carnivores are in turn eaten by a bigger mammalian carnivores, such as bears, wolves, and coyotes.⁶⁵ Therefore, contamination of water threatens the food chain's continuation not only because it destroys aquatic plant life, but also because fish, amphibians, and freshwater invertebrates cannot reproduce properly. Acidified water forces invertebrates to mutate in order to survive.⁶⁶

Yet not all basic organisms are destroyed by chemicals from mining activity. In fact, some microorganisms are actually immune to certain toxic wastes released into the environment. Some of these microorganisms are more than just immune to toxic waste - they help retard the negative impact of toxic wastes in the environment.⁶⁷

The contamination of water quality affects vegetation growth. Herbivores, such as deer, elk, bison, and moose need vegetation for survival. Vegetation, whether it is destroyed by erosion, chemical reactions, or other physical disruptions of the soil, cannot

⁶⁴ Ripley, Earle A. et.al. (1996). Environmental Effects of Mining. Delray Beach, Florida: St. Lucie Press. p. 13.

⁶⁵ Ibid. p. 52.

⁶⁶ Ibid. p. 97.

⁶⁷ Ledin, M. and Pedersen K. (1996 October). "The Environmental Impact of Mine Wastes Rose in their Significance in the Treatment of Mine Wastes." Earth-Science Reviews, 41. 68.

grow, and these animals cannot survive.⁶⁸ Just as acidity causes mutations in aquatic life, it also causes mutations to occur in vegetation. Dying species of plants, therefore, are replaced by species that have mutated in order to adapt to their new soil content. Aquatic life and vegetation adapt to these changes in their environments. However, it often takes fish and mammals longer to adapt to changes in mineral composition than it does to changes in the vegetation and aquatic plants that they eat. These mutations caused by chemical reactions due to mining can cause the population of animals to decrease.⁶⁹ Solutions to problems affecting wildlife, and the environment affected by mining in general, are found in the planning and development of a mine, as well as during reclamation.⁷⁰

Reclamation

Reclamation is the “procedures by which a disturbed area can be reworked to make it productive, useful, nonpolluting or aesthetically pleasing. It does not necessarily imply return of the land to its original physical state of condition”⁷¹ Therefore, in order to plan for future land use after the land can no longer be mined for a mineral, some important steps must be worked through in order to ensure that the land can be used for other purposes.⁷²

⁶⁸ Ripely, Earle A. et al. (1996). Environmental Effects of Mining. Delray Beach, Florida: St. Lucie Press. p. 52.

⁶⁹ Ibid. p. 98.

⁷⁰ Hoak, John. (Wildlife Biologist/General Manager of Mineral Hill Mine). Personal Interview. December 29, 1996. TVX Mineral Hill Mine.

⁷¹ Merritt, Roy D. (1986). Coal Exploration, Mine Planning, and Development. Park Ridge, New Jersey: Noyes Publications. p. 384.

⁷² Ibid. p. 385.

The objective during the planning phase should be to minimize the area that will be cleared or stripped in order to be used in mining operations. Another goal is to keep at low levels the disturbance to native vegetation and soils when disturbance is unavoidable. Also, it is important to avoid or stop erosion that is created by physical manipulations and the replanting of plants already adapted to the climate.⁷³

Avoiding potential environmental problems is important in order to avoid expensive fines and public criticism. Procedures included in reclamation plans are:

- 1) drainage control procedures, 2) topsoil salvaging procedures and spoil segregation procedures, 3) erosion and sediment control procedures, 4) procedures for solid waste disposal, 5) procedures for regrading spoil piles and restoring approximate original contours, 6) seeding and spoil amendment procedures, 7) procedures to reduce the height and slope of the final highwall, 8) procedures to mitigate problems resulting from overburden and coal blasting, and 9) procedures to control fugitive dust emissions.⁷⁴

Montana's constitution clearly states that all lands used during mineral extraction must be reclaimed. Montana has four reclamation programs in order to deal with coal mining, hard rock mining, abandoned mines and sand or gravel materials.⁷⁵ Reclamation plans are custom designed for each new mineral development, determined by whether it is a hard rock mine or a coal mine. Geology and geography are important in reclamation planning, but the type of mining operation established is the key determining factor. Different requirements need to be met for gold mining as compared to what requirements

⁷³ Ripley, Earle A., et.al. (1996). Environmental Effects of Mining. Delray Beach, Florida: St. Lucie Press. p. 13.

⁷⁴ Ibid. p. 284.

⁷⁵ Montana Environmental Quality Council. (1997 January). HJR 10 Compliance and Enforcement Study: Technical Appendix. Helena, Montana: State Capitol. p. 103.

must be met for mining uranium.⁷⁶ A reclamation plan is necessary for obtaining a permit to mine. Operating without a permit is a violation and a mining company will be fined for this activity. The State has an established formula for calculating penalties and for assessing the significance or insignificance of a violation's impact on the environment.⁷⁷

Financial incentives are available to encourage the reclamation of derelict land. The federal government is providing funding for recovering old, abandoned mine sites because tracking down the owner of the site is almost impossible.⁷⁸ Some mines are well over a hundred years old and are no longer in use. Therefore, the logical and responsible thing to do is to try to make the land usable again. The Coal Severance Tax established by the State of Montana in 1975 brought into existence a fund for the reclamation of coal mining. This fund has also been used for hard rock reclamation activity as well. Since 1975, inclusive of 1996, \$90,616,117 has been collected for local impact.⁷⁹

A reclamation plan is required to obtain a mining permit. In addition, an Environmental Impact Statement must be filed, as well as a statement with the Montana Department of Health and Human Services and the Department of Environmental Quality. Obtaining a permit is a long process with various studies and assessments of possible impacts environmentally, socially, and economically.⁸⁰

⁷⁶ Down, C.G. et.al. (1978). Environmental Impact of Mining. London: Applied Science Publishers LTD. p. 221.

⁷⁷ Environmental Quality Council. (1997 January). HJR 10 Compliance and Enforcement Study: Technical Appendix. Helena, Montana: State Capitol. p. 126.

⁷⁸ Down, C.G. et.al. (1978). Environmental Impact of Mining. London: Applied Science Publishers LTD. p. 218.

⁷⁹ Montana Coal Council. (1996). "Montana Coal: 1996". Helena, Montana: Montana Coal Council

⁸⁰ Smith, Duane A. (1989 Winter). "On the Move Again: Hard Rock Mining in the West." Montana: The Magazine of Western History. p. 10.

Economic Impacts

Positive Economic Impacts of Mining

While mining has decreased in its significance in the economy in other western states, it still plays a significant role in Montana's economy.⁸¹ Mining involves some of the highest paying jobs available in the economy, with salaries averaging approximately \$40,000 per year in the coal mining industry,⁸² and \$36,000 per year in the hard rock mining industry.⁸³ People employed by mining operations include geologists, biologists, drillers, core loggers, lab assayers, environmental engineers, and other jobs underground or in supply shops. Job opportunities are diversified and numerous. For example, in 1983, the coal industry alone in Montana employed 1, 237 people, generated an estimated \$459 million in coal sales, and expended \$249 million in Montana. State, local, and federal taxes soaked up \$154 million of the money, and \$96 million was spent in the private sector, which includes payroll, goods, and services.⁸⁴ Obviously, the impact of coal mining alone is significant. However, mining benefits people not only directly, but also indirectly. The “ripple effect” represents the overall economic impact of mining, beginning with the direct purchases made by mining operations in various business sectors to the purchases these businesses make in other sectors.⁸⁵

⁸¹ Power, Thomas Michael. (1996). Lost Landscapes and Failed Economies: The Search for a Value of Place. Washington, DC: Island Press. p. 97.

⁸² Montana Coal Council. (1996) Montana Coal: 1996. Helena, Montana: Montana Coal Council.

⁸³ Knize, Perri. (1996 October 14). “The Price of Gold is High.” Sports Illustrated, 85. p. 86

⁸⁴ Brower, John C. (1985 September). The Economic Impact of Coal Mining in Montana. Missoula, Montana: Bureau of Business and Economic Research, University of Montana. p. 1.

⁸⁵ *Ibid.* p. 1.

Multipliers are the overall measure of the ripple effect. “The multiplier is inversely related to the fraction of local spending that goes to import goods. The more self-sufficient a local economy is, the longer injected income circulates within and the larger the overall multiplier impact.”⁸⁶ In 1983, the employment multiplier for coal mining was 2.853. This can be interpreted as for each person employed by coal mining operations, another 1.853 jobs are created in some other sector in Montana's economy.⁸⁷ The output multiplier, approximately \$459 million in coal sales, “induces an additional \$96 million” somewhere else in Montana's economy. Therefore, the output multiplier is 1.209.⁸⁸ This means that for every \$100 million of coal sales, Montana gains an additional \$20.9 million in sales of goods and services. This additional income also transfers to personal income. In 1983, there were direct payments made to employees by coal companies amounting to \$49 million. Jobs indirectly related to mining operations received an additional \$34 million in 1983, making the overall income multiplier for the year 1.685.⁸⁹

The economic impact of mining can be broken down among the different sectors of the economy. This would illustrate the impact “in terms of employment, economic activity, and income.” In 1983, coal mining created 45 more jobs in agriculture, induced \$1.9 million in grain and meat sales, as well as an additional \$202,000 in income to ranchers, farmers, and agricultural workers. Mining also indirectly created 731 more jobs in retail trade and spent \$16.8 million in retail sales. The millions spent in retail trade

⁸⁶ Power, Thomas Michael. (1996). Lost Landscapes and Failed Economies: The Search for Values of Place. Washington, DC: Island Press. p. 11.

⁸⁷ Brower, John C. (1985 September). The Economic Impact of Coal Mining in Montana. Missoula, Montana: Bureau of Business and Economic Research, University of Montana. p. 1.

⁸⁸ Ibid. p.1.

provided \$8.2 million in personal income to store owners and employees. These figures are significant indicators of the importance of mining to Montana's economy.⁹⁰

With the increase in the world's population and a minimal economic growth, the demand for minerals will increase. Innovations in technology rely on mineral resources, as well as the advancement of society.⁹¹ However, critics of mining as a main source of strength in the economy disagree, and strongly believe that Montana's economy would actually benefit if mining no longer existed.⁹²

Negative Economic Impacts of Mining

At first glance, the addition of a mining operation to a community seems to be a solution to the low income, poverty, and limited employment opportunities available in rural areas. The high salaries and the number of low-skilled jobs that mines introduce into a community are interpreted as a quick fix for the local economy. Thus, there are several problems associated with mine employment that must be analyzed.⁹³

First, employment for local residents is rarely definite or long-term in a mining operation. The reasons attributed to this problem are the fluctuating prices of minerals, operating costs increase, competition with developing countries, and competition with

⁸⁹ Ibid. p. 1.

⁹⁰ Ibid. p. 2.

⁹¹ Mikesell, Raymond F. (1979 September). New Patterns of World Mineral Development. United States: British-North American Committee. p. 1.

⁹² Brower, John C. (1985 September). The Economic Impact of Coal Mining in Montana. Missoula, Montana: Bureau of Business and Economic Research, University of Montana. p. 1.

⁹³ Power, Thomas Michael. (1996). Lost Landscapes and Failed Economies: The Search for a Value of Place. Washington, DC: Island Press. p. 107.

mobile, experienced employees.⁹⁴ For example, underground workers are often brought from outside the community because mines need experienced people for these positions. Mining operations in their best interest will choose more experienced, non-residents over residents because it cuts down operating costs. Therefore, more often than not, locals lose out to nonresidents for mine employment.⁹⁵ In fact, it is estimated that in some cases, such as in long-term, skilled employment, as much as 50 percent of the jobs will go to nonresident immigrants.⁹⁶

With the influx of non-residents to an area, another problem is created. A mining operation will advertise for a certain number of positions, which are usually filled on a rolling basis. Prospective miners flood the area, though not all of them get jobs. It is often the case that these non-residents stay and compete with local residents for lower-paying positions. Consequently, instead of bringing the benefits of high-paying employment, mining operations actually reduce the employment opportunities and lower the salaries for local residents. Therefore, at first glance, it may seem like mining will help the economy, but it is evident that it can do more harm than good in the long run.⁹⁷

The other issue to be addressed is the alternatives to mining. Though critics of mining believe that it does more harm than good, there is no denying that mining does employ a significant number of people. Supporters of mining operations believe that if

⁹⁴ Tilton, John E. (1977). The Future of Nonfuel Minerals. Washington, DC: The Brooking Institution. p. 79.

⁹⁵ Sideri, S. and Johns, S., ed. (1980). Mining for Development in the Third World: Multinational Corporations, State Enterprises, and the International Economy. New York: Pergamon Press. p. 41.

⁹⁶ Power, Thomas Michael. (1996). Lost Landscapes and Failed Economies: The Search for a Value of Place. Washington, DC: Island Press. p. 109.

⁹⁷ Ibid. p. 109.

mining were prohibited, the economy would be doomed. However, Thomas Michael

Power believes differently:

When a mill or mine or factory lays off some of its workers, analysts often react as if those workers have been permanently lost to the economy. This is not the way the labor market works. The U.S. Bureau of Labor Statistics estimates that during the 1980s over 19 million adult Americans were displaced from their jobs owing to layoffs, plant closings, and business failures. If the assumption about permanent unemployment were correct, the total number of unemployed in the nation should have risen by about 19 million. Instead, during the 1980s the total number of unemployed declined about 700,000. Not only were most of the 19 million displaced workers put back to work, but there were an additional 18 million new entrants into the labor force. American workers and labor markets are much more resilient than many analysts suggest.⁹⁸

Power is suggesting that if the mines were closed, former mine employees would be absorbed into another sector of the community. He does not deny that layoffs and unemployment are painful and disruptive to individuals, families, and communities. However, he believes that mine closure is not only necessary for a healthy economy in the long run, but also that the environment and society will benefit from it.

Mining has been considered a "bellwether" industry in Montana. Its instability, shifting with the decline and increase of mineral demand does not provide a dependable job market for young Montanans entering the workforce. With a boom-bust cycle economy like mining, it is difficult to establish stability.⁹⁹

The boom-bust cycle, or business cycle, is a "pattern of fluctuation in economic activity" where there is expansion followed by contraction. Increased business activity,

⁹⁸ Ibid. p. 26.

along with increased industrial production, employment, wages, prices, profits, and interest rates reach a “high point of prosperity,” followed by a sharp decline. This sharp decline sends a community into a “low point.” Recovery is the final phase in the business cycle, but the time it takes a community to recover is unknown. Unless a community has invested in another industry in the anticipation of mine closure, then it will fall into a state of decline and may take many years to recover from it.¹⁰⁰

Social Impacts

Positive Impacts of Mining on Society

Mining operations bring in large amounts of capital to a community, as well as people who are obviously motivated and disciplined.¹⁰¹ This capital supports other businesses, as well as providing money through taxes for schools. In Montana, the Coal Severance Tax has collected \$103,792,439 since 1976, supporting and providing school funding. Schools are dependent upon this fund for computers, salaries for their employees, and other academic advancements. The Coal Severance Tax also supports other departments and projects, such as the State library, Fish, Wildlife, and Parks, Alternative Energy, Water development, the Educational Trust, and many more

⁹⁹ Toole, Kenneth Ross. (1976). The Rape of the Great Plains: Northwest America, Cattle, and Coal. Boston: An Atlantic Monthly Press Book: Little, Brown, and Company. p. 239.

¹⁰⁰ Ammer, Christine and Ammer, Dean S. (1977). Dictionary of Business and Economics. New York: The Free Press: A Division of Macmillan Publishing Company, Inc. p. 54.

¹⁰¹ Power, Thomas Michael. (1996). Lost Landscapes and Failed Economies: The Search for a Value of Place. Washington, DC: Island Press. p. 20.

programs. Without coal mining, these programs and departments would lose millions of dollars in funding.¹⁰²

Development of mining operations contributes to the infrastructure of rural areas. Their development provides improved roads, power plants, housing, and funding for schools. With increased population, more businesses and services are attracted to the community, such as medical care providers, lawyers, educators, and other professional people providing essential services.¹⁰³

The quality of life for some people is enhanced by the services available in a community. Financial wealth leads to a healthy community. Therefore, people with well-paying jobs are willing to spend more on social and cultural events, such as theater, art, music, and education. People who have money will support their local communities by paying more for public services and donating more to communities to keep their support.¹⁰⁴

Negative Impacts of Mining on Society

There are several economic models based on a society without natural resource extraction involved in them. These models are based on the belief that economies can be successful without mineral extraction. They assert that people are happier because their lives are enhanced by their environment, they are financially successful, and they have

¹⁰² Department of Commerce. (1997). Montana's Coal Severance Tax History. Helena, Montana: Department of Commerce.

¹⁰³ Sideri, S. and Johns, S., ed. (1980). Mining for Development in the Third World: Multinational Corporations, State Enterprises, and the International Economy. New York: Pergamon Press. p.40.

¹⁰⁴ Department of Commerce. (1997). Montana's Coal Severance Tax History. Helena, Montana: Department of Commerce. p. 30.

pride in their work. After all, they are not destroying the environment because they are not involved in mineral extraction.¹⁰⁵

The first model under examination is the environmental view of the economy. According to the environmental view of the economy, a beautiful natural environment, recreational activities, cultural richness, reasonable costs of living, safe communities, and quality public services attract a higher-quality, lower-cost labor force, as well as businesses and retirement income. These in turn generate economic activity, which leads to cycles of investment and spending, both locally and export oriented. These four components build a strong community where ongoing economic development is present.¹⁰⁶ The transient workers that mining operations attract bring none of these qualities. Transient workers do not commit to a community because their own economic situation is unstable. They are focused on making money from minerals extracted from the environment, so they are not particularly concerned with its beauty.¹⁰⁷

The other model is the Analytical Economic View. Its basic inputs are the quality of the labor force, its work ethic, entrepreneurial spirit, skill, training, and experience. The quality of organization involves effective cooperation and motivation. The next basic input is quality of technology. This includes organization and the state of applied knowledge. And the final basic input is the quality of the legal structure. The legal structure consists of property rights, contracts, and control of predatory behavior. The basic outputs of these basic inputs are discretionary and subjective qualities, such as,

¹⁰⁵ Power, Thomas Michael. (1996). Lost Landscapes and Failed Economies: The Search for a Value of Place. Washington, DC: Island Press. p. 17.

¹⁰⁶ Ibid. p. 16.

¹⁰⁷ Toole, Kenneth Ross. (1976). The Rape of the Great Plains: Northwest America, Cattle, and Coal. Boston: An Atlantic Monthly Press Book: Little, Brown, and Company. p. 95.

attractive clothes, appealing home environment, supportive medicine, and satisfying services.¹⁰⁸ These two models illustrate that communities can be successful without mineral extraction.

Applying to these two models is the population boom caused in a community by mining operations. With the rapid increase in population, communities have little time, money, and resources to adapt. John S. Gilmore, a senior economist at the Denver Institute, claimed that “too often companies fail to make available to local government planners and decision-makers their planning output- they may even refuse to discuss their intentions and alternatives they have under consideration.”¹⁰⁹

Crime rates increase, alcoholism becomes a common problem, and juvenile delinquency increases as well. Toole attributes this to the population increase of undesirable people in a community from mining operations.¹¹⁰

Quality of life is a difficult concept to qualify. Some people base their quality of life on their income and what it can provide them. Others are more concerned with the “stimuli coming from the environment, biological inheritance, and their own philosophy on life.” Therefore, while we can attempt to define what the quality of life is, it is difficult to do so when an individual has a different concept of what his or her quality of life is.¹¹¹

¹⁰⁸ Power, Thomas Michael. (1996). Lost Landscapes and Failed Economies: The Search for a Value of Place. Washington, DC: Island Press. p. 24.

¹⁰⁹ Ibid. p. 96.

¹¹⁰ Ibid. p. 95.

¹¹¹ Brooks, David B., ed. (1974). Resource Economics: Selected Works by Orris Herfindahl. Baltimore: Resources for the Future, Inc. p. 256.

Evidence supporting both negative and positive effects of mining on a community have been examined in the previous two chapters. Proponents of mining operations claim that it is a viable source for community welfare, improving local economies, contributing to the community socially, and respecting the environment. Mining corporations have made a conscious effort to heal past wounds, as well as to disassociate their current methods of mineral extraction from those used in the past.¹¹²

Opponents of mining operations, on the other hand, discount mining's viability as a social and economic resource, as well as any benefits proponents claim mining has for the environment. Opponents of the mining industry are not convinced that the modern mining industry has made the preservation of the environment a primary focus in its operation. The opposition holds the view that mining is detrimental to a community socially, economically, and environmentally.¹¹³

Opponents of mining operations claim that laws passed to protect the environment are ineffective. Opponents claim that mining companies do not always maintain the environmental standards they are required to uphold because of the cost involved. Inexpensive ways of extracting minerals are always the most desirable, and when there are ways of cutting the corners to ensure a less expensive means of extraction, some mining companies will take that route. Concern for the environment, in some cases, takes a back seat to profit. When rules to protect the community are broken or bent, it is easy

¹¹² Mockler, James D. (Executive Director of the Montana Coal Council). Personal Interview. February 7, 1997.

¹¹³ Power, Thomas Michael. (1996). Lost Landscapes and Failed Economies: The Search for a Value of Place. Washington, DC: Island Press. p. 107.

to understand why trust of mining operations is lost. It becomes questionable whether water, after it has been treated, is clean enough to be mixed with clean stream water.¹¹⁴

Inadequate reclamation plans that have been negligently approved add to the scarring of the landscape from mining rather than solving the problem. Some companies have not taken the precautions necessary to ensure that the land will be suitable for alternative uses after the mining operation has closed down because these plans take time and money.¹¹⁵

In addition to poor reclamation planning, wildlife habitat is still questionable. Wildlife are still disturbed or killed by mining activities, yet very little has been done to stop this. The mining industry has not been able to enforce its regulations for protection of the environment, making any claims that they are working to improve the environment seem false.¹¹⁶

Socially, mining operations do not greatly benefit a community. People involved in mining are not highly educated, and do not place a value on education in the community. Miners move from mining operation to mining operation, rarely staying long enough in one area to contribute to community activities and functions. Lack of education leads to questioning the integrity of the people brought in from different areas. Thomas Power associates the lack of education with the lack of morals and values important in building and promoting a happy and successful community.¹¹⁷

¹¹⁴ Knize, Perri. (1996 October 14). "The Price of Gold is High." *Sports Illustrated*, 85. p. 86

¹¹⁵ Smith, Duane A. (1989 Winter). "Hard Rock Mining in the West." *Montana: The Magazine of Western History*. p. 10

¹¹⁶ Perri, Knize. (1996 October 14). "The Price of Gold is High." *Sports Illustrated*, 85. p. 87

¹¹⁷ Power, Thomas Michael. (1996). *Lost Landscapes and Failed Economies: The Search for a Value of Place*. Washington, DC: Island Press. p. 24.

Mining is, economically, an unstable industry. It provides jobs for people, but the longevity of these positions is unknown. This instability leads to problems with the economic stability of businesses in the community.¹¹⁸

Mining operations generally use as many local resources as possible to support them. Local gas and oil companies, equipment contractors and others usually play a large role in mine operations. Mine employees use all services available and are consumers of almost all products of businesses. Businesses used by mine employees range from the local grocers to restaurants, to banks and post offices. The increase in the number of people increases the profits of these and other businesses owners. Therefore, when a mine closes or withdraws into a mode of exploration and maintenance, local businesses' profits decline. The community declines almost into a state of semi-depression. Job loss not only includes those who worked directly for the mine, but employees who were hired during business expansion. These employees were let go when businesses needed to downsize.¹¹⁹

Proponents of the mining industry contest the points brought up by the opposition. Proponents of mining do not deny that past mining practices have been detrimental to the environment, scarring the earth, contaminating water, and disrupting the wildlife in the area. However, due to advances made in mining technology and their concern for making amends for the past atrocities of the early mining industry, mining operations have made efforts not only to make their practices safer, but to clean up the past.¹²⁰ Reclamation

¹¹⁸ Tilton, John E., ed. (1992). Mineral Wealth and Economic Development. Washington, DC: Resources for the Future. p. 1.

¹¹⁹ Knize, Perri. (1996 October 14). "The Price of Gold is High." Sports Illustrated, 85. p. 88.

¹²⁰ Chiaro, Preston S. (1994 August). "Overcoming Environmental Roadblocks: Costly, but Necessary." American Mining Congress Journal, 80. p. 7.

plans for newly opened mines must be approved before mines can operate. Stricter laws for reclamation plans and enforcement of the plans compel a mining operation to cooperate or face the consequences.¹²¹

Wildlife has also been a concern of environmentalists in relation to mining activity. Proponents of the mining industry recognize the preservation of wildlife as another concern. Mines are located in wildlife habitat areas, and the companies are prepared to take responsibility for this issue. Mines have countered this problem by hiring people to keep waterfowl off of tailings ponds or fencing around areas to keep deer, elk, or other wildlife from drinking from the contaminated water or drowning in it. Noise from machinery around the tailings ponds also helps to keep animals away from the toxic chemicals. Road construction has also been curtailed to inhibit traffic other than that from the mine from disturbing wildlife.¹²²

Economically, mining plays a significant role in a state such as Montana. Thousands of people are employed directly by mining operations, while thousands more rely on the money from mining operations and the employees of mines for profit. Millions of dollars are spent in Montana by mining operations. Businessmen and other industries profit from the millions spent by mining operations. Millions of dollars in taxes are paid to the state each year from mining operations. These dollars from mining operations provide funding for schools, roads, salaries and other government services.¹²³

¹²¹ Smith, Duane A. (Winter 1989). "Hard Rock Mining in the West." Montana: The Magazine of Western History. p. 10.

¹²² Ripley, Earle A., et.al. (1996). Environmental Effects of Mining. Delray Beach, Florida: St. Lucie Press. p. 23.

¹²³ Mockler, James D. (Executive Director of the Montana Coal Council). Personal Interview. February 7, 1997.

Wages paid to many mine employees are excellent, providing for these people a much higher standard of living than do the wages paid on the lower to medium scale of the service industry. Higher wages increase not only the wealth of the individual, but the entire community.¹²⁴

The longevity of a mine, throughout history, has never been particularly stable. People employed by mining operations and the communities in which the operations are located are aware of this fact, and settle for making a good wage or profit for as long as possible before moving to a different mining operation. It is undeniable that mining is not the most stable industry; mining operations have been known to last as little as five years to as great a number of years as forty. The longevity of the mine is dependent on variables that are not controllable by people, making mining operation a profitable but unpredictable existence.¹²⁵

In order to prevent the boom-bust cycle from occurring in a mining community, rents (the returns from the mining and processing of mineral deposits), from the mining operation must be used to stimulate economic growth in other ways. For example, rents need to be invested in “education, infrastructure, industry, and other activities that raise future income.” Citizens of mining communities must take an active role in ensuring their economic welfare in the event of a mine closure.¹²⁶

Obviously, with these conflicting views, it is difficult to determine the extent to which mining has a negative social, economic, and environmental impact on a

¹²⁴ Montana Coal Council. (1996). “Montana Coal: 1996.” Helena, Montana: Montana Coal Council.

¹²⁵ Mockler, James D. (Executive Director of the Montana Coal Council). Personal Interview. February 7, 1997.

¹²⁶ Tilton, John E., ed. (1992). Mineral Wealth and Economic Development. Washington, DC: Resources for the Future. p. 10.

community. It is possible to examine data collected in a case study of a single mining community. In this way, some level of measurement of the impacts a mine has on a particular community, negative or positive, can be assessed.

Chapter III

TVX Mineral Hill Mine Case Study

The TVX Mineral Hill Mine is located in Jardine, Montana. Jardine is approximately ten miles from the larger community of Gardiner, which is the social, economic, and environmental focus of this study.

In the TVX Mineral Hill Mine case study, information was collected by two different methods focusing on two different groups of people. Interviews with experts from opposing sides were conducted to gain a professional, studied perspective of the impact the Mineral Hill Mine has had socially, economically, and environmentally. The other method of data collection used was a random survey conducted in the community of Gardiner. I surmised that conducting a study among the residents and not just the experts would enable me to discover what the feelings are in the Gardiner community about Mineral Hill Mine, whether it has had positive or negative impact from the community members' points of view.

A survey of 120 Gardiner community members was conducted in December of 1996. The survey consisted of demographic information such as age, occupation, and sex of the individual participating in the survey (See Appendix). An individual's name was used as an indicator of who had been surveyed and anonymity was assured to the individual. However, most individuals gave their permission to be cited for comments or ideas that the survey did not directly address.

The survey was conducted in a person to person approach, the surveyor randomly stopped people at the community grocery store, businesses, shops, and the Gardiner High School during lunch break, to ask them to participate in my survey. This approach, I discovered, was far more successful than telephone surveys. I surveyed 61 women and 59 men, ages ranging from 16 to their late 70's. The occupational status of the individuals was far ranging, from students to personal researchers to butchers. Most of the data I collected was limited to "yes" or "no" answers, but others elaborated on why they answered yes or no, giving some insightful data on their feelings.¹²⁷

The first question in the survey asked whether the mine had an impact on the community. This was a general, open question to allow people to give an answer without leading them into a specific response. Of the 120 people surveyed, 98 percent believed it had an impact, one person asserted that Mineral Hill Mine had no impact on the community, while one person did not know if it had an impact or not. Impacts noted in the survey were both negative and positive, some people stating that the negative and positive aspects were so intertwined that they felt that it was impossible not to have one without the other. Positive impacts included the mine's contributions to local activities and organizations, such as the Gardiner ambulance service and fire department, the Dome Mountain 4-H Club, Gardiner Schools, and the local softball and baseball leagues. The Mineral Hill Mine was also noted for the population increase, and the financial improvements in business and individual income. Negative impacts included the

¹²⁷ Rigler, Tara M. (Surveyor). Gardiner Community Survey. December 1996.

shortage of housing, employee scarcity for other local businesses, and the rise in the cost of real estate and rental properties.¹²⁸

The second question on the survey concerned the wildlife in the area. As the original entrance to Yellowstone National Park, Gardiner's economy has relied heavily on the tourists who are attracted to the area's wildlife, as well as to the geological features of the park. In the winter season, businesses have relied on the hunters hunting with outfitters as a source of income. Therefore, wildlife and the land on which they subsist has been an important concern to the people of Gardiner. According to the survey, 5 percent of the people interviewed did not know if the wildlife was affected by the Mineral Hill Mine's activities. The percentage of people giving definite negative answers to this question was 41.7 percent. Of this percentage, 33.9 percent were women and 66.1 percent were men. The percentage who firmly believed that the mine has had a significant negative impact on the wildlife in the Jardine area was 25 percent. Of this figure, 63.3 percent were women and 36.6 percent were men. Angela Lear, a senior at Gardiner High School, stated that the Mineral Hill Mine has had a significant impact on wildlife because the mine has taken away wildlife habitat. Finally, the number of people who believed that there was an impact, but not a significant one, was 28.3 percent of the people surveyed. Women attributed to 67.6 percent of those believing Mineral Hill Mine had no significant impact on the wildlife, while the remaining 32.4 percent were men. Deborah Winkle, the District Clerk of Gardiner Schools, stated that the mine itself did not

¹²⁸ Ibid.

have an impact on the wildlife in the area. In her opinion, it was the increased home building as a result of the mine that had an impact on the wildlife.¹²⁹

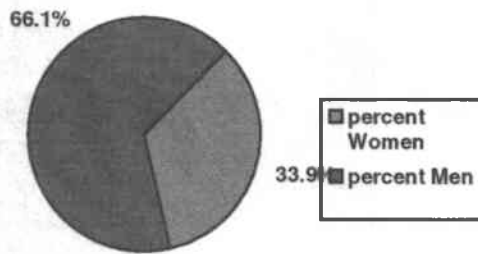
Many residents of Gardiner have valued the lifestyle they have been able to lead, which has relied heavily on an income, as well as personal enjoyment, from outdoor recreation activities, such as hunting, fishing, boating, hiking, camping and other activities. Thomas Power has asserted that mining threatens lifestyles of people who live in a mineral extraction area. The community of Gardiner, though small, has fairly diverse business interests and activities, so it was relevant to include a question in the survey concerning mining and how it affected their lifestyles. While 6 percent claimed that the mine had threatened their way of life, 94 percent claimed they never felt their lifestyle threatened by the mine. In fact, a common comment was that it actually enhanced their lifestyle because the mining operation brought an increase in income and increased environmental awareness. Ken Ballagh, Gardiner Schools' principal, remarked that the mine actually enhanced his way of life. Ballagh said he appreciated the work Mineral Hill Mine has done for the environment. Mineral Hill Mine heightened his awareness of water quality through its cleanup of waste from past mining activities in Jardine. Two individuals remarked that the mine was not a threat to their livelihood until it went into an exploration and maintenance mode in early September.¹³⁰

The environment and the health of a community were also considered relevant. Therefore, a question regarding this concern was included in the survey as question number 4.

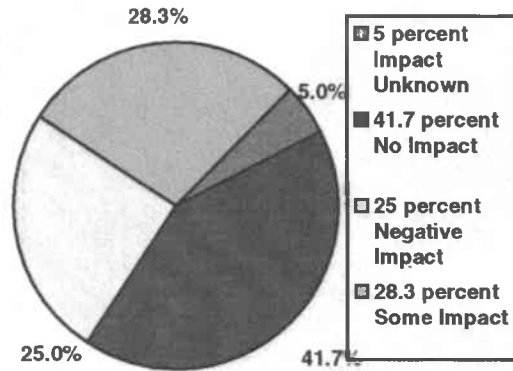
¹²⁹ Ibid.

Survey Question 2 - Mineral Hill's Impact on Wildlife

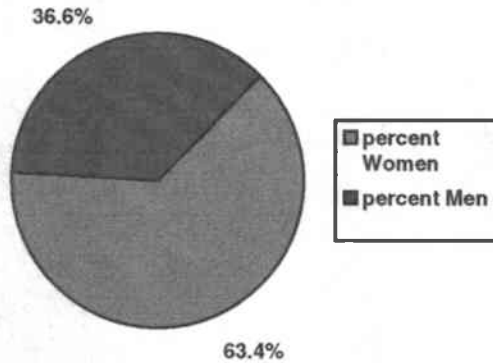
Gender Breakdown-No Significant Impact on Wildlife



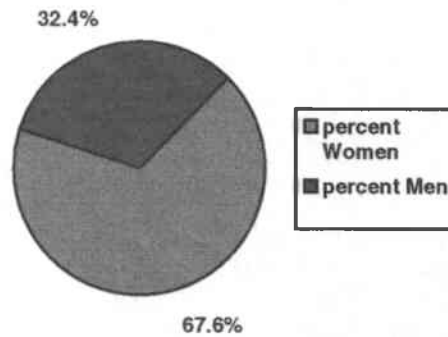
Wildlife Impact



Gender Breakdown-Significant Impact on Wildlife



Gender Breakdown-Small Impact on Wildlife



Of the individuals surveyed, 3.3 percent were somewhat concerned about their health and their environment. Those individuals strongly expressing that Mineral Hill threatened their environment were 16.7 percent. Of this figure, 65 percent were women and 35 percent were men. Some explanations given for this fear were concerns regarding tailings and chemicals used to treat contaminated water, as well as blowing tailings. Elsa Kortgie, a part-time video store clerk and private researcher, said that she has not felt threatened by the mine, but would feel threatened if treated waste were dumped into Bear Creek. Eighty percent of the individuals surveyed felt no threat to their environment, with men making up 54.2 percent of this figure, and women the remaining 45.8 percent. Comments made supporting their feelings of security were that the mine passed all environmental and health inspections. These people commented that they have always felt that the mine has put the environment and the health of the community in a position of primary concern.

Question number 5 on the survey was concerned with mine regulations. Mining restrictions have changed over time, becoming stricter with the advancement in mining technology and a renewed concern for the environment. Years of abuse of the environment by mining companies has increased mining restrictions and regulations, yet some mining companies break these rules and regulations. Therefore, some groups in communities do not believe that mining regulations have been strict enough. However, in the Gardiner community, 75 percent felt that the regulations were strict enough, and of that percentage, 47.8 were women and 52.2 were men. Steve Eversoll, Gardiner High School's chemistry and physics teacher, stated that the mine exceeded environmental standards. He was very impressed with the condition of Mineral Hill Mine's facilities

when he toured the mining operation. Those individuals not knowing if the regulations were strict enough was 12.5 percent. Of this, 46.7 were women and 53.3 percent were men. Another 12.5 percent determined that the regulations were definitely not strict enough to protect them. Women comprised 73.3 percent of this number and men the remaining 26.7 percent. Wendy Thomas, a restaurant manager, definitely thought that water regulations could be tighter. She acknowledged that it would be more costly for the company, but believed it would ensure water quality in the long-run.¹³¹

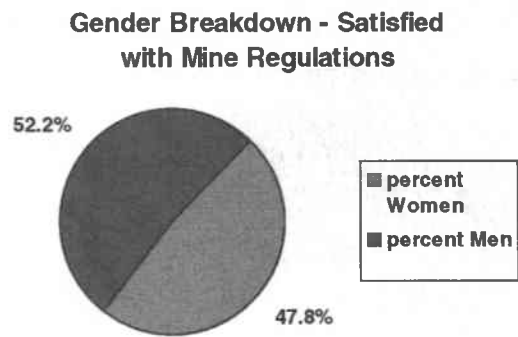
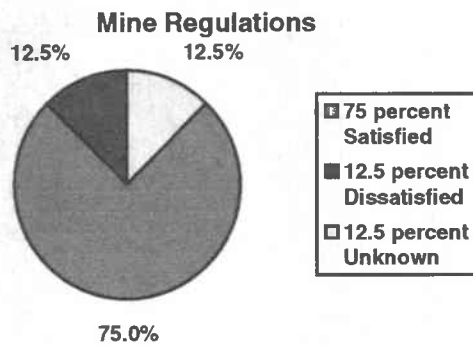
The final question on the survey concerned the individual's economic situation when the Mineral Hill Mine withdrew into exploration and maintenance mode in September 1996. Gardiner, for the past eight years, has relied on the Yellowstone National Park service and the Mineral Hill Mine as the primary sources of employment. The businesses in Gardiner have been largely restaurants, bars, and other service related businesses. Some sources of income are received from rental properties, ranching, and outfitting, but Gardiner has no true industry other than the mine. Gardiner's businesses do not produce anything, but have relied on tourists or locals for a profit. Therefore, this question on the survey had somewhat mixed results. People who were affected by the mine moving into an exploration and maintenance mode were 46.6 percent, while the rest were unaffected. The First Interstate Bank of Gardiner lost several good accounts, though not as many as they feared they would.¹³² The restaurants and bars of the area lost business in September and October until hunting season began.¹³³

¹³¹ Ibid.

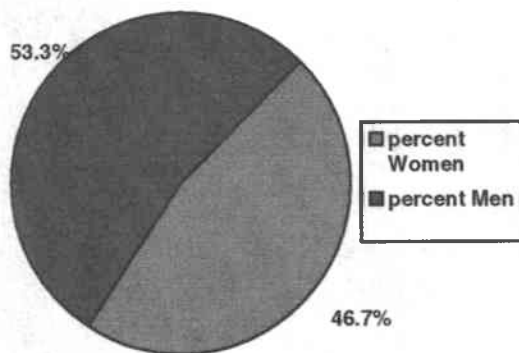
¹³² Hoppe, Cheryl. (First Interstate Bank- Gardiner Branch Manager). Personal Interview. March 15, 1997.

¹³³ Rigler, Tara M. (Surveyor). Gardiner Community Survey. December 1996.

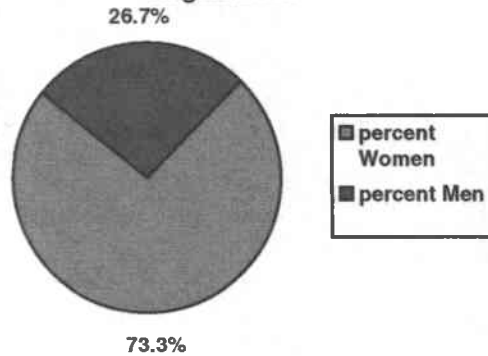
Survey Question 5 - Mineral Hill's Environmental Regulations



Gender Breakdown - Individuals not Knowing if they are Satisfied or Dissatisfied



Gender Breakdown - Individuals Dissatisfied with Mine Regulations



Owners of rental properties lost money when laid-off mine employees moved because they found jobs elsewhere. The North Gate Grocery store lost a lot of business,¹³⁴ and the Rigler Oil Company lost almost a quarter of its business when the Mineral Hill Mine went into an exploration and maintenance mode.¹³⁵ The number of students in the Gardiner Schools system dropped, but the financial affects this has had will not be known until school negotiations have been completed. Also, community organizations lost their major sponsor when the Mineral Hill Mine went into the exploration and maintenance mode.¹³⁶

Of the number of people who were not affected by the loss of the mine as a primary source of employment, fifty percent of these people have known people who were affected either directly or indirectly by the loss of the mine.

The awareness of Mineral Hill Mine's activities varied from person to person, some people admitting to knowing next to nothing or not carrying an opinion of Mineral Hill Mine's activities in Jardine. Others who participated in the survey were very knowledgeable about the mine, having made it their personal concern.

Reopening the mine had a definite impact on the community socially and economically. In general, people were able to raise their standard of living, building new homes as well as contributing to organizations and businesses who offered more services to the community. There were some cases where people found the rising standard of living a negative aspect. This is most likely because their income was not increased as well. Some people were perturbed with the loss of local people to the Mineral Hill Mine

¹³⁴ Demaree, Debbie. (North Entrance Shopping Center Owner). March 15, 1997.

¹³⁵ Rigler, Ronald. (Rigler Oil Company Owner). Personal Interview. March 8, 1997.

because it decreased their own pool of possible employees. However, even with these economic concerns, it seemed that the majority of people from this survey saw the Mineral Hill Mine as a profitable addition to their community. Mineral Hill Mine helped fund many community organizations and services which a lot of people in the community enjoyed and benefited.¹³⁷

Environmentally, people were concerned, but the majority of people trusted the Mineral Hill Mine to make responsible decisions. This trust was very significant, considering the community of Gardiner has relied heavily on its environment and wildlife for tourism, hunting, and other outdoor recreational activities for years as one of the main facets of its economy. Apparently, the majority of people were content with the regulations being strict enough and the mine adhering to the regulations. Some people in the survey even praised the Mineral Hill Mine for its work in cleaning up past mining waste and making water quality a primary concern. Some people in the survey expressed concern that there has been an impact on the wildlife, an inevitability when people invade their natural habitat. Yet, the impact has been considered insignificant by many individuals who were surveyed. These individuals asserted that the number of people who have used the area for hunting, camping, and other outdoor activities have had a greater impact on wildlife than the mine has. Therefore, the general consensus seemed to be that Mineral Hill Mine, though it has had some impact on the wildlife, has been less significant than the impact of people coming into the area for recreational activities.

¹³⁶ Rigler, Tara M. (Surveyor). Gardiner Community Survey. December 1996.

¹³⁷ Rigler, Tara (Surveyor) Gardiner Community Survey. December 1996.

From this survey, I gained an idea of how members of the Gardiner community perceived the Mineral Hill Mine. However, it was necessary to consult experts who have worked in the mining industry, as well as those who have been involved in conserving the environment to gain an inside perspective of the impact a mine has had economically, socially, and environmentally.

John Hoak has been the mine's wildlife biologist and is currently the Mineral Hill Mine General Manager. Mr. Hoak graduated from Algeheny College in Meadville, Pennsylvania earning a degree in Environmental Studies with an emphasis in Aquatic Ecology. As the Mineral Hill Mine's wildlife biologist, Mr. Hoak has supervised the environmental programs and exploration at the mine. Mr. Hoak has worked for the Mineral Hill Mine since its opening in 1988 under the ownership of the Homestake Mining Company and continued working at the Mineral Hill Mine after it transferred ownership to the TVX Mining Company in October of 1993.¹³⁸

I began the interview with Mr. Hoak by asking him about the mineral extraction history of Jardine. It began with the discovery of gold at the mouth of Bear Creek in 1866, before the establishment of Yellowstone National Park. By the 1870's, all of the surface gold in the creek had been mined, and underground mining implemented. This was the birth of the mining camp of Jardine. Mining companies extracted tungsten, arsenic, and gold. These minerals served as a source of income in Jardine until the 1940's. Mining companies left the area after a fire destroyed most of the mill and mine buildings, along with the mining company's inability to solve problems between itself

¹³⁸ Hoak, John. (Wildlife Biologist/General Manager of TVX Mineral Hill Mine). Personal Interview. December 29, 1996.

and the federal government. Over the years, the mine property transferred company ownership several times, with none of the owners developing the area. In the mid-1980's, the Homestake Mining Company purchased the claim, re-naming it Mineral Hill Mine. This company retained ownership until October 1993, when the Canadian based mining company, TVX , bought Mineral Hill Mine.¹³⁹

I then asked him about the concerns involved with the opening of the Mineral Hill Mine. Mr. Hoak addressed the question by starting with the company's three primary concerns: maintaining the water quality, refraining from disturbing or endangering the water quality, and being involved with the community, more specifically the school system. One goal of this company, other than mining gold for economic gain, was to become a part of the Gardiner community. In the first stages of planning, Mineral Hill Mine created a Citizens' Advisory Committee, whose members include a delegate from the Gardiner Schools, the Bear Creek Council, which is the local chapter of the Northern Plains Resource Council, the Yellowstone National Park service, and other concerned citizens' organizations. Together, the Mineral Hill Mine and the community developed a plan for a mine that would be environmentally acceptable. The Bear Creek Council has always been the environmental watchdog for the Gardiner community, so involving them in every step of the development of Mineral Hill Mine was essential to an open and honest relationship between the Mineral Hill Mine and the community of Gardiner.¹⁴⁰

Mineral Hill Mine earned the trust of the community from the early stages in its planning. In 1988, after \$30 million dollars in construction contracts had been signed,

¹³⁹ Ibid.

¹⁴⁰ Ibid.

eagles were found nesting on mine property. The Mineral Hill Mine hired the best eagle biologist in the nation to study the eagles and then to find the best way for the Mineral Hill Mine to work with the eagles in a state of successful coexistence. Mineral Hill Mine also worked with Montana Power, providing funding to upgrade the power lines so that eagles, hawks, and other large birds would not be harmed by the lines in the Jardine area.¹⁴¹

Some community members were concerned with water quality. Mr. Hoak addressed this by stating that Montana has one of the strictest water quality standards in the nation, far above what is required by the federal government (these standards were lowered later by the Montana legislature). Mineral Hill Mine has always been very conscious of water quality, and has had a good relationship with the Department of the Environmental Quality. Any time the Mineral Hill Mine has felt the need to make modifications involving water, they have gone through the appropriate channels to obtain a permit. For example, on February 9, 1996, Mineral Hill Mine received permission to discharge clean, uncontaminated water into Bear Creek. Presently, the Mineral Hill Mine is seeking a Montana Pollution Discharge Permit, which would allow them to discharge water treated through filtration and precipitation into Bear Creek. Issues such as these have involved the Citizens' Advisory Committee, and as yet, there have been no final decisions made.¹⁴²

Addressing the social aspects of the Gardiner community, Mr. Hoak asserted that Mineral Hill Mine has played a significant role in community development. The Mineral

¹⁴¹ Ibid.

¹⁴² Ibid.

Hill Mine made the community a priority, establishing a fund for community development. This fund has been use to aid community youth groups, such as the Gardiner Boy Scouts and Girl Scouts, the Dome Mountain 4-H Club, the Gardiner Little League, as well as the Gardiner Softball League. The Mineral Hill Mine has made contributions to Gardiner High School clubs, such as their newspaper and annual club and athletics. Mr. Hoak has, along with mine geologists and environmental engineers, visited the Gardiner High School and Elementary to give presentations on minerals, the history of mining and the importance of preserving the environment when mining. The Mineral Hill Mine has also plowed roads for people in Jardine. Before the operation of the mine in Jardine, the roads were not plowed because the Gardiner plow does not service Jardine. This service has made the Jardine road safer for residents of Jardine to travel.¹⁴³

Finally, we discussed the economic benefits of mining. The Mineral Hill Mine employed 145 people directly, and between 50-60 people through contractors, making a total of 200 people on their payroll. The payroll for Mineral Hill Mine was between \$4-\$5 million per year. In a community of 800 people, this was a large sum of money. Approximately 25 percent of the Gardiner community was employed by the mine with an average individual income of \$30,000 per year. The Mineral Hill Mine alone spent between \$11-\$14 million per year locally, regionally, and statewide. Mineral Hill Mine has made it a priority to keep as much money in the state of Montana as possible, and more specifically, conducting business with as many local businesses as possible.

¹⁴³ Ibid.

Mineral Hill Mine has paid the state of Montana over \$1 million dollars in taxes per year.¹⁴⁴

It was apparent that John Hoak was very proud of the Mineral Hill Mine and the reputation it has maintained with the community during its full operation.

At one point during the interview, I asked Mr. Hoak who the main opponent of the Mineral Hill Mine has been over the eight years it was open. Mr. Hoak said that there really was not any opposition to the Mineral Hill Mine because of their inclusion of environmental groups in their planning. However, he told me that the closest thing to opposition in the Gardiner community was Richard Parks.

Richard Parks moved to Gardiner in 1953 when he was 8 years old. He attended Gardiner Schools, and later attended college. He is currently the president of the Bear Creek Council, a member of the Gardiner Chamber of Commerce, a member of Trout Unlimited, a member of the Fishing Outfitters of Montana, and a member of the Northern Plains Resource Council, which is the State organization of the Bear Creek Council. Richard owns Park's Fly Shop and guides fishing trips during the summer.¹⁴⁵

When discussing the Mineral Hill Mine with Mr. Parks, I realized why Mr. Hoak called him the "closest" thing to opposition. I asked Mr. Parks what he thought of Mineral Hill Mine, and he answered me by classifying Mineral Hill Mine as atypical, due to its concern with the environment and its determination to work with the people of the Gardiner community.¹⁴⁶

¹⁴⁴ Ibid.

¹⁴⁵ Parks, Richard. (Environmentalist/ Fly fishing Guide and Shop Owner). Personal Interview. December 30, 1996.

¹⁴⁶ Ibid.

Mr. Parks asserted that from the beginning, the Homestake Mining Company demanded that the community become involved with the mine operation. The company listened to what community members had to say about the environment, and other concerns they had. Because of this close relationship, the Mineral Hill Mine and the Gardiner community worked together on issues such as water quality and wildlife disturbances. In its early stages, Mineral Hill Mine had chosen a location for a drain field. During a meeting of the Citizens' Advisory Committee, people in the community expressed some concern about the drain field, claiming that it would cause problems. The Mineral Hill Mine listened to the people of the community, agreed with their assessment, and moved the drain field location at considerable expense. The cost, Mr. Parks acknowledged, was worth it because it gained the respect of the community.¹⁴⁷

Mr. Parks claimed that the Mineral Hill Mine did not disrupt the community economically in the boom-bust fashion that many mines do, qualifying this statement by remarking on the already inflated prices in Gardiner due to the tourist industry. Mineral Hill Mine benefited the community economically by increasing wages. Increased wages led to many advantages for the community. Increased participation in the social setting, such as people volunteering for the fire department and contributions to the Gardiner Schools resulted with the increase in Gardiner's population. Mineral Hill Mine also brought diversity to the community.¹⁴⁸

However, Mr. Parks stated that the Mineral Hill Mine, though beneficial in most facets of the community, has put substantial strain on housing and the cost of housing.

¹⁴⁷ Ibid.

¹⁴⁸ Ibid.

Yet, Mr. Parks believed that people most likely have higher expectations than what are realistic, and will have to lower their expectations. In other words, Mr. Parks asserted that it was most likely that rental properties would have inflated whether the Mineral Hill Mine had operated or not, due to other considerations.¹⁴⁹

Mineral Hill Mine has had very little affect on the wildlife, claimed Mr. Parks, because of the small size of the operation. He commended the Mineral Hill Mine for not keeping its tailings in a pond and attracting animals. However, he did not give all the credit for the lack of wildlife impact in the area to the Mineral Hill Mine, but also to certain organisms' ability to tolerate some chemicals. Indirectly, Mr. Parks asserted, the Mineral Hill Mine has impacted wildlife somewhat due to the increased housing development in the area for the influx of people. Still, according to Mr. Parks, this has not been a significant impact to the wildlife.¹⁵⁰

Mr. Parks agreed that the regulations are strict enough for Mineral Hill Mine because they have gone above and beyond to ensure that they are followed. Again, he stressed that the Mineral Hill Mine is atypical, and this concern and effort to work with the community has rarely been seen in other mining operations.¹⁵¹

Mr. Parks agrees with Thomas Power's idea that mining has been unstable, but does not particularly see how it can be completely eradicated at this point in our energy development. Mining cannot be stopped, at least in the near future, because of the demand for minerals. The mineral demand has risen and they have become harder to

¹⁴⁹ Ibid.

¹⁵⁰ Ibid.

¹⁵¹ Ibid.

find. However, once the minerals are found, it is quicker and easier to extract them due to technological advances in mining. Thus, the longevity of the industry decreases.¹⁵²

According to Mr. Parks, many people do not realize that mining is not the long process it used to be. Mining operations no longer exist in one place for a long period of time. However, as new methods of mineral extraction evolve, old mining sites are revitalized and are mined for financial gain.¹⁵³

As my interview with Mr. Parks ended, he stressed that he did not oppose the opening of Mineral Hill Mine, because it was an atypical mine. It followed regulations, it encouraged the Gardiner community to become involved with the planning of the Mineral Hill Mine, it cleaned up the waste from the earlier mining activity, and it focused on preserving the environment. Basically, if all mines operated in the same fashion as Mineral Hill Mine, there would not be a problem with mining. It can be considered a model for all mines.¹⁵⁴

¹⁵² Ibid.

¹⁵³ Ibid.

¹⁵⁴ Ibid.

Chapter IV

The issue of mining in Montana is not a black and white one. Complications in determining whether a mining operation is beneficial to a community economically, socially, and environmentally are due to several factors.

The economic, social and environmental wants and needs of individuals vary from community to community, making it difficult to measure and assess whether mining would be good for a community, or whether it would be detrimental. The quality of life that one wishes to live is completely subjective, and can only be measured by the individual.

In some communities, the economic and social advantages of a mining operation are not as important as having an undisturbed, pristine environment. Other communities, however, desire the economic boom and social growth resulting from mining operation development. Environmental quality is still important to these people, but they see the necessity of developing the environment to ensure the quality of life they desire.

Mining operations are economically lucrative. It is an industry that provides an opportunity for an individual without a college degree to make a yearly salary of \$30,000. The increase of income not only increases the standard of living of the individual, but also of the community.¹⁵⁵ Increased income provides more activities and opportunities for people of all ages to interact and live happier, better lives.

¹⁵⁵ Mockler, James D. (Executive Director of the Montana Coal Council). Personal Interview. February 7, 1997.

Yet, there are economic problems associated with mining, such as the boom-bust cycle, that do not result in the vision of a healthy, prosperous community. Rather, the vision is one of an economically depressed, socially dysfunctional community. To counter the affects of the boom-bust cycle, rents from mineral extraction must be invested in other industries or activities that provide financial stability. When this is done, the welfare of the community, socially and economically, can be preserved and the impact of a mine closure will not be as significant. Some communities, such as Butte, have managed to survive by replacing mining with other industries. However, other communities have failed to do this, and have been in a state of depression for years with little hope of recovering in the near future.¹⁵⁶

Socially, a mining operation can be an asset to a community. It provides diversity, additional services, and the financial support of community events and organizations. However, if capital from a mining operation is not reinvested wisely in a community, the loss of the mine's contribution to these activities is significant.¹⁵⁷ Therefore, in order to avoid this, communities should invest wisely in future development. Unfortunately, some communities are not that far-planning, and these additional services and community activities are lost when a mine closes.

The mining industry, in general, has worked with environmental groups to make stricter mining regulations in order to remedy the poor reputation gained during the 1970's. According to the American Mining Congress, the mining industry's willingness to implement stricter rules in their operations made by state and federal governments and

¹⁵⁶ Tilton, John E. (1992). Mineral Wealth and Economic Development. Washington, DC: Resources for the Future. p. 10.

improvements in technology have shown that the industry wants to move towards a more environmentally friendly industry. However, though the movement of the mining industry may generally be moving towards maintaining and preserving the environment, not all mines are involved in this effort. Protecting the environment from degradation from mining is expensive, adding costs and taking away profit from an operation. Consequently, not all mining companies share the goal of preserving the environment, and this is where the problem lies.¹⁵⁸

Arguments for both sides of the issue have their own truth. Therefore, it is impossible to lump together a mining operation's social, economic, and environmental impact on a community with other mining operations. Instead, each mining operation must be looked at separately from others, and assessed according to environmental standards of the state and federal governments, and the social and economic needs of the community. For example, the Mineral Hill Mine is an example of a model mine, and one that definitely should not be associated with the mine at Lincoln. Therefore, mining operations should not be stereotyped.

The Mineral Hill Mine was opened in an atypical community in Montana. The Mineral Hill Mine played a significant role in the Gardiner community economy. However, as the original entrance to Yellowstone National Park, Gardiner was not completely reliant on the Mineral Hill Mine for its economic base. Tourism, the Yellowstone Park Service, and various outfitting services also support the Gardiner community. This is not to say that the Gardiner community did not experience an

¹⁵⁷ Rigler, Tara M. (Surveyor). Gardiner Community Survey. December 1996.

economic and social shock when the Mineral Hill Mine's withdrew to an exploration and maintenance mode. However, it should be acknowledged that many mining communities in Montana do not have the same economic resources as Gardiner.

The Mineral Hill Mine's withdrawal to an exploration and maintenance mode proved to be upsetting to the community. However, it was not a surprise to the Gardiner community. During exploration, the mine was only expected to produce 7-8 years of gold reserves. Hopes were raised when the company began the Crevasse Mountain project, but there were no projections for the future. People employed by the mine knew that it is an unstable industry and would not last forever.¹⁵⁹

The Mineral Hill Mine was a model of a modern mining operation managed with the intent of protecting and preserving the environment for future use. It made water quality and wildlife in the operation area a priority. This, according to Mr. Parks, makes it entirely different than most mining activities.

In addition to its determination to preserve the environment, the Mineral Hill Mine also made it a priority to contribute to the Gardiner community. Because the mine employees became involved with education and community activities and services, the people felt like the mine cared about more than just extracting minerals. It gave back to the community from which it took.

Based on the Mineral Hill model, I concluded that mining can be an environmentally safe and effective part of the economy. Mining can benefit communities

¹⁵⁸ Mockler, James D. (Executive Director of the Montana Coal Council). Personal Interview. February 7, 1997.

¹⁵⁹ Hoak, John. (Wildlife Biologist/General Manager for TVX Mineral Hill Mine). Personal Interview. December 29, 1996.

socially. However, unless environmental regulations are enforced, unless communities are involved at all levels of mining development, and unless rents from mineral extraction are effectively invested in a community, then mining cannot be considered a feasible part of our economy, our society, or our environment.

Appendix

Gardiner Community Survey

Name:

Occupation:

Age:

Male Female

1. Did the mine have an impact on the community?
2. Has Mineral Hill Mine had an impact on the wildlife in the area?
3. Have you ever felt that the mine threatened your way of life?
4. Have you ever felt that the mine has threatened your health or your environment?
5. Do you feel that the mine's environmental regulations are strict enough to protect your community?
6. When Mineral Hill Mine closed this past September, did it have an impact on your economic situation?

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