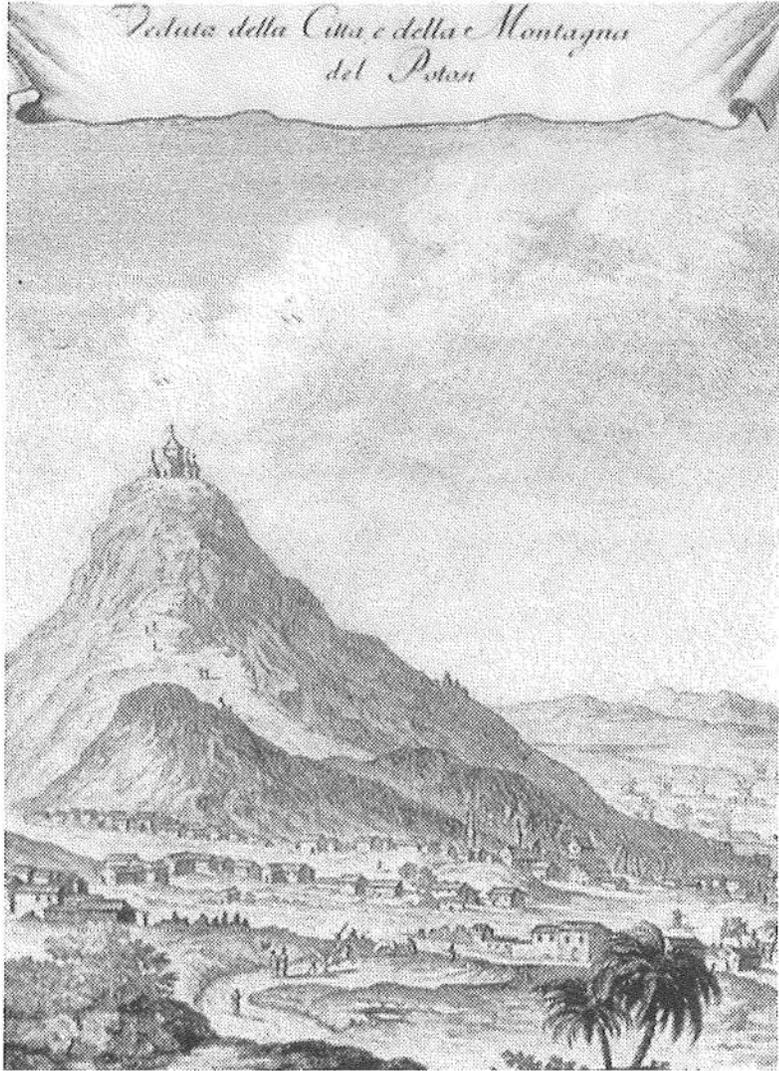


*Veduta della Città e della Montagna
del Poton*



THE IMPACT OF MINING ON THE ENVIRONMENT OF GRANT COUNTY, NEW MEXICO TO 1910

Christopher J. Huggard

IN 1903, FAYETTE A. JONES, author of the world's fair edition of *New Mexico, Mines and Minerals* (1904), visited the once-thriving silver mining camp of Georgetown. The sight of abandoned buildings "casting their ghostly shadows" struck "fear" in him. The shells stood silently; the bustle of the past could only be imagined: "Oh what utter desolation,!" wrote the former president of the New Mexico School of Mines. What remained at the old townsite was a spiritual attachment, "glinting in the setting sun." Three-and-a-half million dollars in silver had been gleaned from the earth. The real beauty of this natural spot, he was implying, blossomed when minerals, timber, and water were exploited to "civilize" the wilderness.¹

As the above story suggests, Anglo Americans came to southwestern New Mexico Territory to extract natural resources. Riding on the wave of "manifest destiny," they came to incorporate these lands into the United States even though they met stiff resistance from its peoples and the land. This region, as they viewed it, was hostile wilderness "invested" with Apaches and drier than much of the Great Plains. The Native Americans they eventually subdued, but like the myopic farmers who believed that "rain followed the plow," immigrants of the mining frontier counted on civilization to follow their technology. Mining enterprises and the concomitant extraction of ores, wood, and other natural resources was the catalyst for late nineteenth century immigration into the "new southwest."²

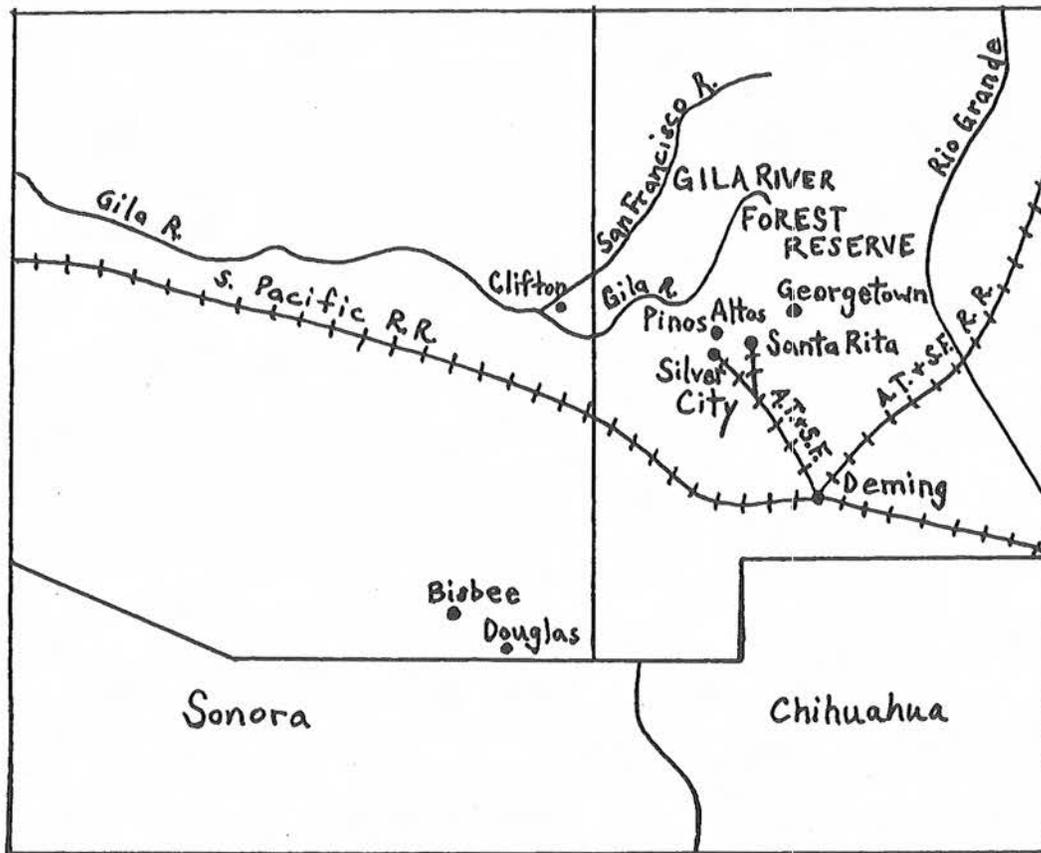
Yet the machinations of mining alone could not open southwestern New Mexico to industrial America. The railroad, in fact, lured the investors, miners, and settlers who transformed Grant County into the trading center of the region, while also settling the new towns of Silver City, Georgetown, Santa Rita, and many others. With eastern capital and capitalists arrived machinery and building materials. In addition, the rail-

road drew farmers and ranchers to the vast valleys of the northern extension of the Mexican Highlands, where they sold their commodities--fruits and grains--in nearby town markets, taking advantage of freighting links with the East and Far West. "The advent of the railroads in New Mexico [in the 1880s]," Ralph E. Twitchell suggested in 1912, "was the beginning of an era of permanent prosperity for the people of the territory....New Mexico was really in touch with the enlightening progress and modern methods of people of the Eastern states."³

The mining boom in Grant County brought not only prosperity to the settlers, but also the heavy destruction of the environment. Like mining companies throughout the American West, the industry of the burgeoning Southwest clear-cut stands of yellow pine, red fir, scrub oak, and juniper to timber the shafts and fuel the blast furnaces and smelters, denuding the mountainsides of the once-lush Gila forests. Ore dumps from both underground and placer diggings made the slopes even more susceptible to erosion. The mules that hauled the ores and machinery trampled the one remaining natural glue, grass. Noxious smelter gases and particulate matter that rose from smokestacks and then settled onto the landscape killed still more vegetation.⁴

These factors alone caused enough ecological damage. Compounding the destruction were the ranchers who overstocked the same hills with their cattle. After enduring thirty years of timber harvests and overgrazing the hillsides gave way in August 1895. That summer rains ending an extended drought swelled to

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Map 1. The American Southwest - Mexican Highlands Area

floodwaters that roared through the center of Silver City. The slashing waters cut a gorge later named the "Big Ditch." Floods of similar magnitude cascaded through Grant County's principal town each summer, carving a permanent canyon. Not until the federal government set aside the Gila River Forest Reserve in 1899 was some effort exerted to manage the timber and grasslands.

The mining districts of Grant County are dissected by the Continental Divide, which rides the crest of the Black Range just north of the famous Santa Rita copper mines. Here nature deposited nearly every metal, from gold and silver to copper and iron, as well as other less-exploited minerals such as turquoise and fluorspar. The southern thumblike dip of this resource-rich range, known as the Mimbres Mountains, intrudes into the Mexican Highlands. Gradually the highlands descend to Sonora and the desert of northern Mexico. West of the Divide rise the Mogollon Mountains whose melted snows feed the Gila River watershed. Its peaks tower above the rolling terrain to the south where the hills of the Burro Mountains reemerge as the northernmost formations of the Mexican Highlands west of the Rio Grande and east of Arizona.

In the higher elevations of these mountain ranges,

some 7000 feet, grew the yellow pine, red fir, and juniper. Below that, from 4000 to 7000 feet scrub oaks and bear grass thrived. The region was and is drenched by summer rains that most often pour down with afternoon heating. Orographic precipitation keeps the top third of the peaks heavily overgrown with trees and grasses. Most of the main mining districts, such as Central, Pinos Altos, and the Burro Mountain, received at least twelve but no more than twenty inches of rain annually.

Into this dynamic semiarid environment, humans introduced their mining activities. As early as the tenth century, the Mogollones worked the outcroppings of native copper at Santa Rita. They formed the famous *cascabeles* around wooden molds and pounded out breast plates that adorned the chests of chiefs as far away as Alaska and Florida.⁵ Yet the Native Americans, who probably heated the copper ores to make the bells and armor, had neither the desire nor the technology to mine on a large scale. Not until about 1800, more than 250 years after Coronado first learned of the Southwest's coppers, did the Spanish introduce modern mining to New Mexico. A few years later, Manuel Elguea, a subdelegate to New Spain and a successful Chihuahua merchant, won the Santa Rita del Cobre land grant and

began mining the rich copper mines.

Up to the time of the American Civil War, small contingents of Spaniards, Mexicans, and Americans periodically mined copper at Santa Rita. They constructed adobe furnaces and melted the native copper into ingots of about 150 pounds. To fuel the smelters, the miners made charcoal from the pine and juniper trees in the vicinity of the works, and later, in the Gila Forest. They selected the best logs of ten or more feet for ladders that transported the miners to the timbered shafts. Their pick-and-shovel technology allowed them to dig as deep as the top of the water table, normally no more than sixty feet underground; although water was an essential ingredient in processing ores, and its scarcity often slowed production, it limited the depth of the mines, and therefore, the development of the copper industry. In the end, these early ventures did not overtax the natural resources of the region, though dozens of mine shafts and their waste dumps dotted the landscape below the rim of the Santa Rita escarpment.

The extensive degradation of the mountainsides and hillsides of southwestern New Mexico began with the invasion of the American, from the 1860s on. But instead of copper, the new immigrants were interested in gold. The vanguard of the goldseekers was the United States Army. During the Civil War, officers such as Brigadier General James H. Carleton encouraged their men to prospect for gold and silver in the mountains of the Southwest. Soldiers among Carleton's own California Column learned of the placer deposits of Pinos Altos in 1860-61 from the local Mexican residents, and then discovered the "blue gold" at Silver City in 1870. As part of his furlough system, General Carleton required his soldiers to work in the mines, of which he generally owned a large percentage. He hoped to instill a sense of community among the men with this practice.⁷ Meanwhile, they made a futile attempt to force out the Warm Springs Apaches (or Mimbrenos) under Victorio. The Indians' fierce defense of their homeland blocked permanent settlement until after the war. They continued to resist American domination until 1886, when Geronimo and his band of Chiricahuas were the last to surrender to the invaders.

After the Anglos established permanent residence in the new county of Grant in 1868, three distinct periods of mining development can be recognized up to 1910. The first was the pre-railroad era between the late 1860s and the mid-1880s, when gold and silver production dominated. In the second phase, the arrival of the railroad and new, more productive technology initiated a silver boom during the late 1880s and early 1890s. New companies introduced modern machinery such as energy-driven hoists and Cornish pumps, stimulating production, while simultaneously increasing the strain on the local ecology to meet the day's standards for

industrialization. In the final phase, the industry shifted from silver to copper mining between 1893 and 1910.

This last period witnessed the creation of the Gila River Forest Reserve in 1899, and the subsequent federal regulation of timber cutting. The new resource management laws and greater demands on nearby resources forced the mining companies to look elsewhere for fuel and timbers. Consequently, the companies turned to coal as their energy resource that, after 1883, could be easily freighted on the Southern Pacific line from the coal mines in northern New Mexico. Likewise, freighters railed timbers from the Pacific Northwest. Both fuel and timber needs outgrew the yields of the Gila Forest, especially after federal regulations limited lumber output. At the same time, the Forest Bureau reduced the number of cattle allowed in those same forests, resulting in a period of ecological mending; the bear grasses began to grow back on their own and reserve rangers planted seedlings to replenish stands of pine.

Prior to the arrival of the railroad, gold first lured miners into southwestern New Mexico. Placer miners panned streams and washed hills in search of instant wealth, like the '49ers of California and the '59ers of Colorado. But by the late 1860s the richest placer deposits played out and gold mining became a seasonal endeavor because most creeks ran intermittently, limiting the water supply. As a result, hard rock extraction replaced the more individualized panning and rocking in both Pinos Altos and Silver City.

Initially, the miners utilized the Mexican arrastras and adobe smelters introduced to the region before 1848, and still the most commonly used machinery as late as 1880. The arrastras were rock-lined, circular troughs with stone mullers connected to a central pivot. Miners dumped the quartz-laden ores into the pit and mules pulled the rock crusher over them, freeing the gold and silver from the waste materials. They then sluiced and smelted the crude ores and dumped the wastes nearby.⁸ Together an arrastra and smelter could process approximately two tons of ore a week, a meager amount by later standards. In the meantime, small swaths of the nearby forests were turned into charcoal or cord wood and then consumed in the furnaces. Here, with the piling of wastes and the cutting of timber combined with grazing and trampling work animals, the ecological balance was beginning to tilt in favor of destructive erosion and potential flooding.

By 1872, the center of mining was at Silver City. Mule trains carried refined silver and gold southward to Mexico and westward to San Francisco. In that same year, four stamp mills--the Bremen, the Rynerson, the Coleman, and the Tennessee--increased the productive capacity of the county; mainly, western and local investors financed this transition from fairly primitive to

modern machinery, despite the extraordinary costs to freight in such equipment prior to rail transport. Employing between five and forty stamps, the new, steam-driven mills crushed ores into a powder that was washed over copper plates containing mercury. The amalgam was then heated in a retort that liquified the mercury for use again. The gold and silver product was made into bars for shipment to Mexico or, as the 1870s wore on, to the eastern United States.⁹

With this growing activity, Silver City became the center for new financiers and prospectors, who began to find silver and gold in other corners of the county. By the late 1870s, nearly forty mining camps stood within a seventy-five mile radius of Silver. Georgetown, San Jose, Hanover, Shakespeare, Kingston, and Steeple Rock were six of the most productive camps, strewn from the Black Range to the Burro Mountains to the Mogollon Rim. Silver City natives had also founded the Arizona copper camps of Globe and Clifton by 1880.

Before the coming of the railroad, therefore, Grant County showed signs of thriving permanency. From the late 1860s to the early 1880s, in fact, the county led all of New Mexico in metals production, topping the half-million dollar mark each year.¹⁰ Yet, a large percentage of the ores were sent to other places such as Pueblo, Colorado and El Paso, Texas for refinement. This practice of shipping ores, a sign of limited technological development even in the less-industrial West, spared much of the timber that would have been needed to fuel blast furnaces and smelters. In addition, despite the lack of federal regulation of timber and grassland use, only a minimal toll was taken on the surrounding hills of the Black Range and Pinos Altos Mountains. Still, the precedents for expansion combined with a growing community desire for a rail line portended an ominous future for the forests and fields of the county's woodlands.

Dramatic changes arrived with the railroad. The Atchison, Topeka & Santa Fe (AT&SF) constructed a line through eastern Grant County in 1881. The AT&SF then connected with the Southern Pacific at Deming, seventy miles south of Silver City. The vast ore deposits of the region were now connected to the industrial East and the burgeoning Far West. Miners and prospectors who represented companies from San Francisco and Boston nearly ran off the end of the tracks as they tried to find substantial ore bodies to justify new mining towns. Southwest of Silver City, for example, the Valverde Mining Company with ties in the East founded their town of Paschal. The company created an "eastern" setting with a "substantial hotel" and frame homes, combined with a southwestern architectural touch by constructing an adobe boarding house. Furthermore, Valverde railed in modern mining machinery, steam engines, modern hoisting equipment,

and the famed water jacket furnaces for smelting. The introduction of new technology throughout the county, however, exacted a heavier toll on the environment.¹¹

With the initiation of the railroad era, the production of silver and gold in Grant County increased to more than a million dollars per year. Even into the depression of the early 1890s and later, the output of precious metals remained high.¹² After the Southern Pacific tapped into Silver City in 1883, Boston, Philadelphia, New York, and San Francisco capitalists imported up-to-date blast furnaces, mills, and smelters. As each new branch of the Silver City & Northern Railroad reached into the eastern part of the county, mining companies began to develop larger bodies of ore, requiring greater reduction capabilities.

By the mid-1890s, copper and iron mines at Santa Rita and Hanover were producing after more than a decade of idleness. The production of base metals, in fact, stimulated the expansion of the refining industry in Silver City where three custom smelters--the Grant County Mining and Milling Company furnace, the Argo Reduction Works, and the Flagler Smelter--sat on Silver Creek by 1890; and with the steady growth of ore production in the region during the mid-1890s, the Bretherton Smelter and the Silver City Reduction Works further heightened the productive capacity of the county. Although Mexican arrastras and other minor mills and furnaces were still in operation in even the remotest mining camps in Grant County, Silver City clearly became the modern smelting center for the region, its industrial base extending into southeastern Arizona.¹³

The cost of Grant County's newly-found diversification and sustained prosperity (that has continued today despite some hard times), however, was the destruction of the forests that surrounded the principal mining districts of Pinos Altos, Silver City, and Central. A single mill or smelter, for instance, consumed 100 or more cords of wood a week. In addition, as miners dug deeper into the earth, they needed more logs to timber the new shafts; better steam pumps allowed them to dig far below the sixty-foot barrier of an earlier era, and mines now reached depths of more than 500 feet. Year after year, loggers and lumber companies (sometimes owned by mining companies such as the Bremen Mining Company) pushed deeper into the nationally-owned Gila Forest lands. They especially cutover Bear Mountain and Gomez Peak in the Pinos Altos Range. United States district attorneys in Las Cruces made futile attempts to stop much of the illegal harvesting of wood on the federal lands.¹⁴

And no doubt the federal government sent mixed messages to the frontier mining areas of the American West. The Mining Law of 1872, in fact, encouraged timber cutting on mineral claims. The miners' equiva-

lent to the homestead bill, the law not only awarded claimants a piece of mineral land as much as 1500 by 600 feet in size, but it also provided "the exclusive right to possession and enjoyment of all the surface,"¹⁵ which included wood, of course. Prospectors also had the right to claim as many of these timbered mineral claims as they could afford at \$100 each per year. Six years later the Timber Cutting Act had given a still stronger mandate to miners. It "authorized and permitted [miners] to fell and remove, for...mining...any timber or other trees growing or being on the public lands, said lands being mineral...nothing...shall prevent any miner...from taking the timber necessary to support his improvements..."¹⁶ Like many frontier Americans, miners of Grant County took advantage of these laws often cutting timber and grazing lands beyond the allotment of their mineral claims, thus placing a heavy strain on the region's forest and grassland resources.

Other mining-related activities threatened the ecological balance in the surrounding mountains as well. Mule-trod paths were susceptible to erosion. Mules and other beasts of burden also overgrazed the hillsides of the same mountains being overcut. The innumerable mine shafts and their dumps also contributed to erosion of the slopes. The smelters and blast furnaces spewed toxic smoke over the terrain, killing much of the vegetation needed to save the soils from washing into arroyo-cut valleys of the county. Combined with these evolving ecological threats was overgrazing by cattle. Numbering under 100,000 in 1887, they increased to more than 200,000 by 1895. More than a decade of ecological recklessness and destruction prepared the ground for the raging floods that washed through the area annually from 1889 to 1906.¹⁷

Ironically, the worst floods in Grant County inundated downtown Silver City. Prior to 1895, the residents welcomed these "freshets," as the local newspaper called them, because they "purified" the streets by taking sewage and garbage downstream.¹⁸ But no one saw humor in the massive flood of 1895. In a single afternoon, the flood's powerful currents transformed the Main Street gully from a minor washway into a gorge. From that afternoon until 1906, the channel regularly ate away at the canyon walls that served as the foundation for many of the buildings of the business district. The 1902 flood, in fact, washed away more than twenty feet of the bank of the "Big Ditch," taking half of the headquarters of the Silver City Enterprise, its roof hanging over the new thirty-five foot dirt cliff like an opened sardine can. Other towns in the county such as Mogollon, Cooney, Hanover, and Santa Rita suffered similar flooding during this same period. When Bear Creek flooded in 1902, the churning waters filled the valley from "bank to bank, a mile in width."¹⁹ Not surprisingly, the run-off from the same denuded moun-

tains fed Bear and Silver creeks, the sources of the worst floods in the Gila forests and in Silver City. The damage to the landscape, however, was of less concern to locals than the loss of real estate, commercial and domestic buildings, ore piles, mining equipment, and animals; the people managed to stay out of harm's way, not a single death being attributed to the tortuous floods.

In the end, residents either denied or refused to accept the true reasons for the floods. Rather than address the issues of overcutting in woodlands and overgrazing of grasslands, the latter which they blamed Hispanic shepherders for, they chose to confront the result instead of the source of the problems. The "city fathers," for example, opted to construct breakwaters and dams at intervals in the Big Ditch. Year after year, however, each new dam was washed away when continually greater forces of water cascaded out of the mistreated Gila wilderness.²⁰

Federal intervention combined with natural forces eventually remedied the flood problems of Grant County, initiating the final stage of mining development in the area before 1910. Concern for the plight of the forests of the United States had been brewing for at least two decades prior to the first major flood in Grant County. The unchecked destruction of forests to the east, especially in Michigan and Wisconsin, had driven conservationists to organize to protect federal lands in the West. By 1891, their pleas influenced congressional passage of the Forest Reserve Act which gave the president power to set aside federal forest lands in reserves to be carefully managed to maximize resource use, at the same time protecting the lands from ecological destruction. As a result, President McKinley targeted the federal forests of southwestern New Mexico, creating the Gila River Forest Reserve in 1899. The lands were now under the control of the Division of Forestry in the U.S. Department of the Interior.

The two-fold framework for protecting the Gila forests was based on sustained-yield or "wise use" of the natural resources. First was the regulation of timber cutting; second, the regulation of livestock grazing on those same lands. The careful management of the Gila woodlands, like all federally-owned forests, required professional rangers (e.g., in the Gila Forest, the predecessors of Aldo Leopold) to watch over the nation's natural stores. As a result, the Forest Bureau (renamed from Division of Forestry) began charging woodcutting and grazing fees after 1904 despite widespread protests by the mining, cattle, and lumber industries in Grant and Catron counties. Yet they had to comply. Newly-assigned rangers roamed the Gila Forest, prosecuting those who did not go through proper channels and secure the requisite permits, introducing a new era of close management of the region's vital woodlands.²² As

early as 1905, a Department of Interior study showed that progress was being made to reduce erosion; at the same time, replanting of pines witnessed regrowth in timber as well.

Federal regulations alone did not stop the flooding in Grant County, however. Rather, natural forces, accelerated by human endeavor, had created a deep gorge that safely channeled floodwaters through Silver City. The floods had cut a new bed in Silver Creek each year until it was deep enough to carry even the most raucous flashflood. Hence, the flooding problems were solved, at least until the late 1930s when drought forced nature's hand. (Later, the Corps of Engineers and the copper corporations--Phelps Dodge and Kennecott--altered the Gila River and many of the creeks of the county after World War II causing renewed flood problems beginning in the 1960s). Moreover, the mining industry no longer depended on local wood products for fuel, construction, and mine shafts, further reducing the pressures on the Gila Forest after the turn-of-the-century.²³

A new age of resource use and enforced ecological consciousness dawned on the county. This is not to say, of course, that human behavior transformed overnight to save the environment from any more ecological damage. Rather it marked federal awareness of the potential exhaustibility of the nation's resources. Likewise, the mining industry and technological change would result in new environmental challenges in Grant County, especially with the introduction of open-pit copper mining in the 1910s. Water rights and water contamination, for example, would become major issues, replacing the earlier concerns for the woodlands. Likewise, the eventual introduction of massive copper smelters, that poured tons of sulfur dioxide and other ghastly fumes into the air and "blurred"²⁴ the southwestern skies, would inspire environmentalists to rise up in revolt in the late 1960s and early 1970s. But these and other environmental issues comprise another story to be told at a later date.

In conclusion, it seems fitting to refer back to Fayette Jones' despair at the death of Georgetown by 1904. Indeed, the formerly-prosperous silver camp had become a ghost. But its disappearance also represented the end of an era of wanton destruction of the forest lands in Grant County, New Mexico. In the modern period, the mining industry would only become bigger and more powerful. Despite and because of those changes, the industry adjusted, and though it began a concerted drive to control and manipulate the region's other resources such as water, the Gila Forest was spared.

ENDNOTES

¹Fayette A. Jones, *New Mexico, Mines and Minerals* (Santa Fe: New Mexico, 1904), 45.

²The term "new southwest" was used in the *Silver City Enterprise*, 25 January 1883, to describe the growing mining industry in Grant County.

³Ralph E. Twitchell, *The Leading Facts of New Mexican History* (Cedar Rapids, Iowa: Torch Press, 1912), 482.

⁴Duane A. Smith, *Mining America, The Industry and the Environment, 1800-1980* (Lawrence, Kansas: University Press of Kansas, 1987), 5-24; also, see J. K. Haywood, *Injury to Vegetation and Animal Life by Smelter Works* (Washington, D.C.: GPO, 1908).

⁵Billy D. Walker, "Copper Genesis: The Early Years of Santa Rita del Cobre," *New Mexico Historical Review* 54:1 (January 1979), 6; Thomas A. Rickard, *A History of American Mining* (New York: McGraw-Hill, 1932), 251.

⁶_____, *The Chino Enterprise* (New York: Engineering & Mining Journal Press, 1923-4), 758.

⁷Darlis A. Miller, "Carleton's California Column: A Chapter in New Mexico's Mining History," *New Mexico Historical Review* 53:1 (January 1978), 8-9.

⁸Conrad Naegle, "The History of Silver City, New Mexico, 1870-1886," (M.A. thesis, University of New Mexico, 1943), 120-1.

⁹*Ibid.*, 125-33.

¹⁰Eleventh Census of the United States, 1890 "Report of the Mineral Industries of the United States" by David T. Day (Washington, D.C.: GPO, 1892), 40-2.

¹¹*Silver City Enterprise*, 1 March 1883.

¹²Twelfth Census of the United States, 1900 "Mines and Quarries" (Washington: GPO, 1905), 265.

¹³*Silver City Enterprise*, 16 March 1894, 17 September 1897.

¹⁴*Ibid.*, 16 March 1888.

¹⁵42 Cong., 2d sess., May 10, 1872, c. 152, 17 Stat., 91, "An Act to promote the Development of the mining Resources of the United States."

¹⁶45 Cong., 2d sess., June 3, 1878, nc. 150, 20 Stat., 88, "An act authorizing the citizens of Colorado, Nevada and the Territories to fell and remove timber on the public domain for mining and domestic purposes."

¹⁷Ralph E. Twitchell, *An Illustrated History of New Mexico* (Chicago: Author, 1895), 190.

¹⁸*Silver City Enterprise*, 9 August 1895.

¹⁹*Ibid.*, 1 September 1893, 4 August 1899, 29 August 1902, 5 September 1902, 26 August 1904.

²⁰Ross Calvin, "How Main Street Became the Big Ditch," *New Mexico Magazine* 12 (August 1934), 37-8; *Silver City Enterprise*, 26 August 1904.

²¹For the best discussion of the federal bureaucratization of the conservation movement at the turn-of-the-century, see Samuel P. Hays, *Conservation and the Gospel of Efficiency, the Progressive Conservation Movement, 1890-1920* (Harvard: Harvard Univ. Press, 1959); also, see Michael McCarthy, *Hour of Trial: The Conservation Conflict in Colorado and the West* (Norman: Univ. of Oklahoma Press, 1977).

²²*Silver City Enterprise*, 1 February 1901, 15 February 1901, 21 February 1902, 12 September 1902. Miners from Cooney were arraigned in U.S. District Court in Las Cruces for cutting timber without permits. The verdict rendered them guilty to pay fines in accordance with the amount of wood each of them had allegedly cut.

²³Theodore F. Rixon, "Forest Conditions in the Gila River Forest Reserve, New Mexico" 58 Cong., 3d sess., 1905, H. Doc. 411.

²⁴See Steve Hinchman, "The Blurring of the West," *High Country News* 25:12 (June 28, 1993): 10-13.