From Boom to Bust: Post Gold Rush Patterns of Adjustment in a California Mining Region. (Volumes I and II).

Lary Michael Dilsaver

Louisiana State University and Agricultural & Mechanical College

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FROM BOOM TO BUST: POST GOLD RUSH PATTERNS OF ADJUSTMENT IN A CALIFORNIA MINING REGION

Volume I

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The Department of Geography and Anthropology

by

Lary Michael Dilsaver
B.A., California State University, Hayward, 1971
M.A., California State University, Hayward, 1977
May 1982
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ABSTRACT

Mining in Nevada, Placer, El Dorado, and Amador counties in California began with the discovery of gold at Coloma in 1848. Thousands of people flocked to the region, built towns, roads, and an economy dependent on placer gold mining. Declining placer resources, coupled with strikes outside California, signalled the end of the boom period in the region. A long adjustment in the man-land system culminated with the end of mining as a significant economic function during World War I.

Three major processes operated to alter the region from one with a mono-functional economy, a mobile population, and spatial homogeneity to one with a diverse economy, a stable population and settlement network, and spatial heterogeneity. First, mining slowly relinquished control of the economic system retreating from five successful forms one by one. Placer mining fell to resource decline, mining of other minerals to competition, drift mining to expense and difficulty, hydraulic mining to legal restrictions, and quartz mining last to inflated wages and supply costs and a fixed gold value. Each new setback decreased miners and the population total.

Access to transport and external markets encouraged former subsidiary industries to develop and compensate in some areas. Agriculture, lumbering, and recreation all
flourished by 1920 along the transcontinental railroad and the Placerville Wagon Road.

Finally, although most miners emigrated, new immigrants replaced many of them altering the demographic and settlement patterns. By 1920 the population had been halved, but virtually all miners had departed. The remaining residents clustered in large towns and fewer resource zones as the many small mining camps disappeared and new towns servicing agriculture, lumbering, and railroads replaced some of them. Foreign-born decreased in numbers and proportion with mining, and the demographic profile came to represent those of California and the West.

Each of these processes was influenced by the others, but the most important was the decline of mining. Where mining persisted, economic, legal, and social patterns adapted to it. Where mining declined or disappeared the greatest changes occurred.
INTRODUCTION

During the settlement of America's successive frontiers, a steadily increasing influx of pioneers filled most available habitats. Successively stabler farming groups succeeded fur trappers, herdsmen, and subsistence farmers. Each group intensified land use, population density, and settlement. Later, urban-transport networks further increased the population of the former frontier. For the most part, these regions have been settlement success stories, growing up to the present.

The mining frontier of the American West stands as a notable exception to this pattern. In most cases, it lay in rugged, hitherto ignored areas far from western agriculture. The mining frontier was not settled by a process of exploration and steady subsequent immigration by determined farmers. Rather, a massive, unparalleled influx of mineral seekers rapidly pushed the regional population well beyond the support capability of any other economic function.

In the rapid development of these frontiers, miners and those who supplied them established certain settlement patterns, roads, and subsidiary economic functions adapted to mining. The presence of gold formed the basis for population distribution. Agriculture, lumbering, and services were wholly oriented to provision of the mining market. Young men from around the world dominated the
population, reflecting the character of the principal industry--temporary and mobile but aggressive and domineering. The mining frontier was different from any other. It was a man-land system that quickly became overpopulated, overbuilt, and dependent on a monofunctional economy.

Easily accessible minerals eventually played out in most of these regions. Subsequent adjustments were painful, occasionally catastrophic. The wounds are still evident in dead or greatly diminished towns, abandoned mine shafts, and relics of an age and occupation now part of legacy and lore.

Western mineral rushes have long intrigued researchers and writers. Numerous books and articles focus on each region. Ocean and overland journeys, mining techniques, camp law and society are all considered. Most writers conclude their studies by briefly describing the end of the mining rush and its detrimental effects. Intensive research and detail of this stage are lacking. This is the end of the story for most mining frontier studies (see especially Paul 1947; Bancroft 1880; Caughey 1948).

The purpose of this study is to explain the evolution of a mining frontier from its heyday as the nation's most reknown gold region to the time when mineral extraction formed an unimportant part of the area's economy. It begins when events signalled the close of successful placer mining and concludes when the region's population
grew despite further mine failures.

The study area was part of the first and most famous of all gold mining regions, the Sierra Nevada of California. The richest of California's goldfields lay along the western foothills of the Sierras in the four contiguous counties of Nevada, Placer, El Dorado, and Amador. The study area contains the parts of these counties that had placer mining in the 1850s. These counties are particularly well suited as examples because they:

1. Are the most important as measured by population and gold production;
2. Are representative of the problems and opportunities that beset all California gold regions;
3. Have township boundaries that remained fairly constant and thus allow accurate temporal analysis;
4. Are adjacent, affording the opportunity for broader analyses of town size and distribution patterns;
5. Form a valuable and representative social and economic cross-section that includes:
   (a) the major hydraulic mining areas
   (b) more than half the major quartz mining areas
   (c) the transcontinental railroad
   (d) a very successful agricultural county (Placer)
   (e) considerable ethnic diversity
Both the terms "Northern Mines" and "Southern Mines" were widely used by contemporary observers and later historians (May, 1971). The former included the northwestern part of the state and the northern Sierra counties down to Placer. The latter usually meant from El Dorado County south along the Sierra Navada. The term "Mother Lode" was also used as a synonym for Southern Mines, although its meaning became obscured later (Ibid.). Because the study area includes elements of both the northern and southern groups, the compromise term of Central Mines is used in the text.

**Method of Organization**

This study is an exercise in historical geography. As geography, it deals with spatial patterns and the relationship of man and the land. Three geographical criteria, land use, population characteristics, and settlement patterns, are examined both independently and as interrelated elements of a man-land system. Together they form the substantive phenomena that concern all geographers, except those enmeshed in the earth-studies tradition. As an historical treatise, the study also focuses on process and change. The principal purpose is to analyze the role of each geographical criterion in the adaptation of this socio-economic system to decline in its fundamental resource.
The element of diachronic dynamism has been the weak link in the subdiscipline of historical geography. Time-slice studies, often masterpieces of descriptive art, suffered from repetitiveness or lack of perspective. Retrogressive and retrospective methods often became static detective stories for the landscape school of geography. Sequent occupance began the movement in American historical geography toward a diachronic approach, particularly in regional economic studies. Indeed, Whittlesey's article, "Sequence Occupance" (1929), may be termed the foundation of modern American historical geography. Yet this was merely a series of time-slices piled one upon another. Andrew Clark's "changing geographies" were well aimed efforts at overcoming this deficiency. Acadia (1968) and Prince Edward Island (1959) are detailed attempts to preserve the dynamism. But, both studies became lost in regional details and failed to communicate the dynamic nature of evolving cultures or economies operating in changing environments.

Perhaps the best effort in creating a cohesive, spatial and temporal analysis of a man-land system was penned by Jan Broek in 1934, early in the course of the subdiscipline. His study of the Santa Clara Valley blended carefully detailed analyses of process and cause, communicating the events and techno-cultural adjustments to the natural landscape, with periodic overview descriptions at critical
points in time. The beauty and systems cohesion of the time-slice and sequent occupance approaches, thus, were carefully interposed with discussions of processual changing geography. One weakness of this method is loss of detail, but for preservation of diachronic, spatial, and systematic character, its potential is unexcelled.

The Broek approach is eminently useful for addressing this question of adaptation. The body of this study consists of a series of chapters analyzing the major changes in land use, including technology and production, occupational and population characteristics, and settlement patterns, alternated with three short overviews at critical points in time. The overviews outline the transition from an economically focused, impermanent, and geographically homogeneous region to a more balanced one based on multiple economic functions, permanent and stable population and settlement patterns, and geographical heterogeneity.

The gold rush began in 1848 and significant changes started as early as 1852, the turning point occurred in 1859. That year signalled the end of the boom period when major mineral strikes in British Columbia, Colorado, and, most important, Nevada, drew away thousands of hard luck miners from California. By 1860, a decline was underway that continued to the 1920s, with some interesting exceptions. During the first twenty years, patterns of change were established. In the next twenty years, enjoinder of
hydraulic mining further changed the man-land system. During the final twenty years, the last ties to mining were shed as the region finally escaped its long dependence on gold.

This study examines the changing geography of the Central Mines area over a period of six decades in an attempt to understand the process of adaptation and the emergence of new man-land relationships. The basic questions to be addressed are: How did the mining industry change? What role did agriculture, with which most miners were familiar, lumbering, in this most lucrative of forest ranges, and transport, along the few approaches to the Sierran crossing, play in preventing complete decay? How did people cope with this economic collapse? What became of the myriad, bustling, ambitious camps and towns where miners lived and played? In summary, how did the man-land system alter temporally and spatially to a condition of equilibrium with the new carrying capacity of this rugged, distant territory?
CHAPTER 1
THE GOLD RUSH SYSTEM

The Central Mines counties are located on the western flank of the Sierra Nevada in the middle portion of California. The four counties lie approximately 120 miles east of San Francisco and 25 miles east of Sacramento (Map 1-1), port cities that affected all activities in the study area during and after the gold rush. The region focused westward because nearly 2000 miles separated California from the major population centers of the nation's Old Northwest, such as Chicago and St. Louis. The intervening territory was rugged and often desolate, semi-arid to arid, and contained a number of hostile Indian groups. The journey to California, whether by land or sea, represented a substantial commitment for which many, though they planned otherwise, could not and did not return.

The most significant physiographic characteristic of the Central Mines was its terrain. The Sierra Nevada consist of a single great block faulted and uplifted on the eastern side and tilted toward the west. Moderate to heavy orographic precipitation through the millenia has created westward flowing streams that have dissected the western slope into a series of parallel ridges trending northeast to southwest. Tributary streams have deeply
INCLUDES 3, 5, 6 AND 7 WHICH DUE TO PROGRESSIVE CONSOLIDATION AND UNCLEAR DIVISION OF POPULATION WERE TAKEN TOGETHER
incised these ridges. The resultant landscape ranges from zones of sharp slopes and scarps in the east, with relief reaching more than 1000 feet, to gently rolling, hilly areas in the west.

In general, elevation increases from west to east. (Figure 1-1). The most densely settled and developed portion, both at present and during all post-Indian history, occurs between the altitudes of 800 and 2000 feet. Rolling hills surround narrow canyons and scattered alluvial flats. All other factors being equal, these areas of level terrain received more economic and settlement attention than the surrounding hillsides. Location in distant California and ruggedness of terrain were permanent and critical natural factors in the man-land system of the Central Mines.

A third important feature was the region's subsurface geology, specifically the location and accessibility of gold. Gold occurs in three forms. Each form played a distinct and crucial role in the evolution of land use, settlement, and population patterns in the study area and in the perception of the area by residents and potential immigrants. In the Central Mines, gold initially formed in subsurface rock by the precipitation of mineral elements from intrusive magma. This molten material expanded and cooled as it pressed into the dense rock above. Water in the magma was expelled carrying with it mineral elements.
FIGURE 1-1: PROFILE OF CENTRAL MINES TERRAIN ALONG THE CENTRAL PACIFIC RAILROAD SHOWING GEOLOGICAL FORMATION

(AFTER: CALIFORNIA STATE MINING BUREAU 1917)
Which elements precipitated and concentrated in fissures and along the contact zone with surrounding rock depended on the temperatures and pressure at that point. In the case of the Mother Lode and other Central Mines vein systems, silica in solution also precipitated as quartz. Hence, mining for gold in hard rock became known as quartz mining (Burgess 1948; 87-88). Quartz containing gold and other minerals occasionally formed in a long series of parallel fissures. The Mother Lode, a mile wide belt of veins stretching 120 miles from Mariposa, near Yosemite National Park, to Georgetown in the Center of the Central Mines region, is such a zone. Other major veins occurred in western Nevada County and in Amador County near the town of Volcano (Map 1-2). These zones usually contain several mineral elements due to their sequential precipitation as temperatures in the magma changed. California's Sierran zone is no exception. Copper, zinc, iron and several other metals occur in proximity to the gold veins. Their quantity and value, however, were far overshadowed by gold in this, one of the richest and purest auriferous zones in the world.

Erosion exposed gold bearing veins in some places after their formation in subsurface rock. This ancient process began here when the Mother Lode and other Sierra Nevada veins were formed over 100 million years ago (Ibid., 87). Streamcutting then removed particles of gold along with
MAP 1-2: QUARTZ VEINS, TERTIARY RIVERS AND GRAVELS, AND MODERN RIVERS OF THE CENTRAL MINES
other material and deposited them where runoff slowed sufficiently. Over the centuries, during countless floods, erosion scattered bits of gold along streambeds and amid the surrounding alluvial borders. Due to variations in levels of tectonic activity and precipitation, there were periods when erosion and deposition was greatly intensified. One of the most important was the early Tertiary period beginning some 60 million years before present. The river system of that period deposited gold in zones of alluvium, called Tertiary gravels by California mining geologists. These former river beds have been uplifted by later tectonic activity and partially exposed by the erosion of modern rivers (Map 1-2). Ridges of Tertiary alluvium, therefore, form the second great source of gold for the Central Mines prospectors.

Placer gold was the most recent, most widely distributed, easiest to work, and the reason for initial significant white occupancy of the Sierra Nevada foothills. Placer gold resulted from erosion and deposition in more recent geologic periods, and lay along most of the numerous rivers in the Central Mines region. It offered the advantage of occurrence on or close to the surface. Indeed, placer gold could occasionally be found with the naked eye as happened at Coloma. This discovery began California's American period in earnest as well as an attractiveness to settlers that has persisted for more than a century in the Golden State.
The Gold Rush

The earliest incursions by non-Indian peoples into the Sierra foothills were probably forays by far-ranging mission padres in search of runaway neophytes. They contributed little to the knowledge of the area and its ecosystems. Likewise, the earliest Americans, fur trappers such as Jedidiah Smith and Kit Carson, brought little information to the outside world. The mountains first became known significantly as a barrier that was either avoided or laboriously crossed by Central Valley bound pioneers, some of whom died in the attempt. The first move toward establishment of a permanent economic function with associated settlement was a sawmill constructed on the American River at the present site of Coloma. John Sutter, an empresario favored by the earlier Mexican authorities and by later American military officials, contracted with one James Marshall to supervise construction of the mill and provide lumber for construction in the largely treeless Central Valley. It was a move that propelled Marshall into the limelight of history and spelled eventual economic catastrophe for his employer.

On January 24, 1848, the mill was well on its way to completion when Marshall, acting on the queries of his men, picked a shiny bit of metal from the tailrace of the mill. After rudimentary tests, he pronounced it gold. Curiously, the impact was initially negligible, Employees
completed the sawmill, began work, and gathered gold on their off hours. Marshall did discuss the matter with Sutter, and both agreed to suppress news of the discovery. However, this decision was taken from their hands. Rumors leaked, unexpected visitors came to check on the stories they heard, and some returned to San Francisco hailing the richness of the finds and the opportunities to be had. The fever was slow to start but dynamic once in progress. June of 1848 saw virtual abandonment of San Francisco and other central coast cities. Los Angeles and the southern portion of the territory subsequently surrendered their farmers, merchants, soldiers, and townsmen. The discovery was also initially dismissed in the East, despite reports on the California rush by military governor Robert Mason. However, the appearance of one of Mason's officers with a bottle of gold dust, and an announcement of the gold discovery in President Polk's annual address to Congress served to excite the press and the populace both in America and Europe. Backwards, distant, calm California would never be the same (Bancroft 1880).

Several means existed for getting to the California goldfields, all of which were arduous and somewhat dangerous. Most American immigrants travelled either overland from the East along the Oregon and California Trails, or by sea to Panama, overland across the tropical isthmus, and again by ship to San Francisco. A third means, by ship
around the horn took so long that it discouraged most would-be miners. Foreigners came from Europe, China, Australia, and Latin America, pouring into the goldfields individually or in companies as early as 1850. The population of California skyrocketed from only 10,000 non-Indians in 1848 to over 100,000 by 1852. The majority combed the hills and streams of the western Sierra Nevada from Mariposa to Sierra counties and many of the greatest mining successes and largest population concentrations were in the rich Central Mines counties (Paul 1948: 24-25).

The majority of the miners, despite world interest, were American in the early years of the gold rush. In 1850, slightly less than one-fourth of California residents were foreign born. Most of these hailed from Mexico or some other part of Latin America. By the end of the 1850s, however, thousands of Chinese, British, French, and others added strong foreign influences to California mining. Despite later becoming a minority, Americans always dominated the region through ownership, management, and operation of technologically advanced mining and by staffing and controlling many important subsidiary functions such as transport, agriculture, services, and government.

Most members of California's early population, whether foreign born or American, shared two traits—they were young and they were male. In 1850, the state's population was 92.5 percent male. The females who did inhabit the rough
and insalubrious early mining camps were, according to Hittell, "neither maids, wives, nor widows" (Paul 1947: 81-82). In addition, most members of this male dominated population were from 20 to 45 years of age. A wife or a child was an oddity. Infirmity and old age, combined with the rigors of the journey to California and miserable health conditions upon arrival, prevented many from immigrating and killed others soon after. The mining frontier more than any other type of frontier, placed the rigors and effort of development squarely upon the shoulders of young, somewhat footloose men.

Most gold seekers who flocked to California were inexperienced in mining. Many, upon arrival, barely recognized gold in its natural occurrence. They were fortunate, however, that they were in search of a resource that initially occurred in astonishing quantity. Knowledge of where to look for gold and how to extract it was available from those with experience. Sonorans and other Mexicans were the first teachers. Later, men from Dahlonega, Georgia's small goldfields added their expertise. Armed with these newly learned skills, miners fanned out along the mountains and foothills prospecting for the rich finds that would allow them to strike it rich and return home to loved ones and a comfortable life.

The primary characteristics of these early placer mining methods were simplicity, individuality, and low expense. Each method took advantage of the fact that gold
was heavier than sand, gravel, and other materials with which it was found. The miners' pan was the earliest and most primitive placer mining tool. A shallow basin, even a frying pan could be used with water. The suspected gold-bearing alluvium from a streambed or bank was scooped into the pan and then, with water, it was tipped and rotated back and forth spilling out the lighter material and leaving behind the gold. This method, though simple and cheap, was arduous work and required rich gravels to remain a paying venture. It was quickly replaced by more efficient methods.

One early improvement, with origins in ancient Europe, was the rocker. It bettered the panning technique by facilitating the creation of motion to separate waste from gold and by allowing larger loads to be processed. The rocker resembled a baby's cradle and consisted of an oblong box with a sieve or hopper at the upper end and an opening at the lower. Dirt and gravel were introduced to the hopper where, with the aid of copious amounts of water, the larger rocks and consolidated fragments were removed. The remainder of the material washed along the bottom, aided by the rocking motion, and the gold was caught by a series of riffles or obstructions. With this innovation, several cubic yards of material per day could be washed by each miner, an improvement over the one cubic yard that an ambitious panner could manage (Averill 1948; 19).
Another device was the long tom which, like the rocker, had diffused to California from Georgia. It functioned in the same manner as the rocker but used a slope and gravity rather than a cradle footing. A continuous flow of water entered the upper end and carried the gravel over a series of riffles where gold would collect until the flow ceased and the tom was cleaned. Where the rocker was limited in size by the need to provide motion, long toms could be quite large, limited only by the number of men available to introduce the gravel. Usually, four to six man teams operated the toms, but water diversion canals also required considerable labor before a return could be realized. Hence, even in the early days of California mining, loose partnerships laid the foundation for the later company structure of Sierran mining.

The technological successor to the long tom was the sluice box. Sluices consisted of lightweight, portable, riffle-lined boxes twelve to fourteen feet in length. They were constructed so that the ends fit together in a string creating a long trough through which water and material passed. Gravel was introduced directly to the continuous stream of water at various points along the string. The riffle principle was improved by making them removable for easy cleaning and extraction of gold (Paul 1947; 62-63).

Both the long tom and sluicing methods employed quicksilver, or mercury, along the bottom of the troughs.
Gold easily amalgamated with it increasing the weight of the nugget and, thus, its chance of being caught on a riffle. Subsequently, the amalgam could be heated in an enclosed vessel causing the mercury to evaporate and leaving pure gold. This ancient method had a well established history of use in Europe and Latin America (Ibid.).

The wide distribution, richness, and ease of extraction of placer gold continued to bring miners into the region well after the peak of production in 1852. Although the composition of the population shifted toward foreign dominance, the essential characteristics of the placer system did not change. Whenever a rich strike was made, word of the discovery brought other miners wandering and later rushing to the spot. Enormous concentrations of men, more than 10,000 in many cases, demanded services, supplies, and entertainment. Towns formed of tents, crude wooden shacks, and an occasional brick structure seemed to spring up overnight. They were the side effect of a headlong rush for gold. When the gold in one area began to dwindle, miners drifted off looking for new strikes. A town of 10,000 would, and in some cases did, depopulate as rapidly as it had formed. The region's settlement was unstable, its population mobile and consumed with monomania for gold. It was a monofunctional man-land system, heavily populated due to the sheer richness and easy extraction of its principal resource.
The System in the 1850s

The characteristics of mining boom areas have been the subject of study and popular account for more than a century. Mining frontier towns, populations, and economic patterns differed widely from those of virtually any other time or place in the American experience. There are many ways to describe the qualities, but they are best summed up in three terms—focused, ephemeral, and homogeneous. Each communicates important aspects of the economic, settlement, and population profiles of the Central Mines during the 1850s.

The California Gold Country was highly focused economically. Nearly all residents were placer miners. Indeed, gold and its pursuit furnished the only topic of interest and worth to the ambitious pioneers who sought it. Even those in subsidiary economic activities often spent free time in pursuit of the precious metal and, if successful, abandoned their jobs. Mining was legally favored over all other land uses. No cornfield, no dooryard garden, no road, in many cases not even an established town, could take precedence on the land bearing gold. Likewise, water, timber, and services were absorbed into the voracious mining industry with no thought of the needs for any other function.
The narrow scope of the economy and its commanding usurpation of services and resources caused all other functions to form as adjuncts to mining, its support their sole function. Agriculture was very small scale and local, forming around sites of successful mining. Plots were small, investment light, and production limited due to the threat of land loss to mineral claims and the competition for labor by mining. Virtually all produce was transported to nearby towns and camps to be sold for placer gold. Herds of livestock were raised on the public domain for similar sale. Lumbering was equally small scale and consisted of part-time and a few full-time woodcutters hauling firewood and timbers to the insatiable mines and camps.

Infrastructure also reflected the monofunctional character of the economy. Town morphology was based on stream courses where industrious miners scoured for gold. Unlike most frontiers, settlement was highly nucleated with virtually no rural population save the occasional prospector. All residents concentrated in clusters marking the sites of successful mining and, in a few cases, supply nodes that benefitted from hinterland camps. Roads connected the mining camps, which were themselves located mainly on the basis of geology. Vast numbers of wagons and mule trains plied the dirt roads bringing food and implements to supplement the tiny local production.
Due to this focused quality, the economy depended wholly on an industry that was notoriously ephemeral. This characteristic pervaded life and landscape in the Central Mines. Residents intended, in nearly all cases, to get into the mining country, gather a healthy sum of money in a hurry, and return home in the glory of their experience and new wealth. This population, uprooted from myriad backgrounds and tested by arduous journey to the Golden States, was mobile and impatient. They drifted from one site to another following their hopes and spurred by rumors.

The towns and camps of these wandering miners were famous for their short lives. Some inflated to populations of more than 10,000, only to see them dissipate to a few hundred or less in a matter of two or three years. Optimistic town fathers often found themselves with a ghost town when gold played out and new strikes commanded the attention of the populace. Usually, they did not wait to observe the ultimate fates of their settlements. If the gold ran out, even the biggest of towns could virtually cease to exist as its principal industry and the bulk of its population moved on. Some towns were large enough by the end of the 1850s to be safe from overnight collapse, but the ephemeral nature of this system remained a threat throughout the boom years in the Central Mines.

A monofunctional economy and the rapid and frequent population and settlement shifts marked the Central Mines
with internal homogeneity. Each of the four counties exhibited a pattern of scattered gold camps. Each by 1859 boasted a few towns that had consolidated some of the support activities, though these were still small. The eastern portions of each county saw limited hard rock and Tertiary mining, plus timber cutting. There was little difference among the four counties in land use, settlement patterns, and population despite minor ethnic segregation near the end of the decade. All the mountain counties were equally given to mining and the erratic man-land system that is engendered.

One further point concerns the role of the Central Mines, and the California Gold Country in general, in the state. In the early 1850s, this region was the core not only of the state, but of the West. Mining economically transformed California, converting San Francisco from a lazy entrepot to the gateway for thousands of miners and their supplies. The state's farmers struggled to feed the huge population. In 1852, more than one-third of California's population resided in the four Central Mines counties. Travelers to California generally were headed for the mines, more often than not the Central Mines. The tiny area was the goal of thousands from around the world.

The unstable, skewed, and economically focused man-land system mirrored the characteristics of its resource
base—so valuable that all functions focused on it, widely spread through the region but in clusters, and of limited quantity such that local deposits often disappeared in a few months. Of far greater significance, the time came when placer gold became scarce throughout the region. The ephemeral character of the entire economic and population system led all too soon to a time of reckoning.

The Onset of Decline

By 1857, gold production in California had dropped to half the level of five years earlier (Paul 1947; 118) even though ever wider sources were being worked. Placer gold declined even more rapidly. With the depletion of this resource, daily wages dropped from 20 dollars in 1848 to a mere three dollars by 1859 (Ibid.; 120). More and more miners, primarily the Americans, re-evaluated their lot, their prospective mining ventures, and their homes left so far behind, and opted for the latter. Some were replaced, many were not. Amid this decline, several important events occurred, marking the beginning of the main period of adjustment of land use, population, and settlement in the Central Mines.

Prospectors from the California fields had wandered beyond the boundaries of the Golden State in their ambitious search for gold. It was not until 1858, however, that a significant discovery was made elsewhere. Along
British Columbia's Fraser River, a gold excitement began that drew Californians into the distant Canadian territory during the spring and summer of that year. The Fraser rush proved short-lived, however, and many disappointed miners returned to the Sierra Nevada vowing not to chase any more wild rumors. Their resolutions were quickly forgotten, though, when news of a great find filtered over the mountains from the Nevada Territory. In June 1859, a former California miner appeared at Nevada City to assay some ore filled with troublesome "blue stuff." The latter turned out to be silver and in such richness as to dwarf the ore value of even the famous Grass Valley mines. The "Comstock Lode," as it was dubbed, was rich beyond hope, and an eastward rush to Virginia City and other Nevada boom towns immediately followed (Caughey 1948; 296-297).

From 1861 to 1864, flooding followed by excessive drought added to the problems in the region. Financially troubled California mining ventures suffered further damage and many of the companies closed operations for good. The effects of these combined factors on settlement and population were immediately felt. Some towns may have lost up to 75 percent of their populations. Nevada County historian, Bean, reported that the hitherto wealthy county lost one-third of its male population to the Comstock fields (Todd 1967; 63). In less successful counties, the declines exceeded 50 percent. These trigger events both exacerbated
and illustrated the weakness of the placer gold resource as a viable long-term resource and the imminence of change for the foothills man-land system. The process of adaptation, the step-by-step evolution of alternate forms of land use, the demographic and spatial changes associated with them are continuing elements of a dynamic system. For sixty years after the Comstock find marked an economic turning point in California, the evolutionary process in the Central Mines was a gradual release from dependence on mineral extraction. These sixty years are the subject of the remainder of this study.
CHAPTER 2
CHANGES IN MINING, 1860 TO 1880

Mining, like all industries, had a set of conditions to meet in order to succeed. Some were attainable by luck, or even whim, while others demanded painstaking work and considerable time. The six critical conditions for mining were:

(1) A knowledge of the resource, particularly its location.
(2) Sufficient capital to exploit the resource.
(3) The technical know-how to exploit it.
(4) The infrastructure necessary to mine it.
(5) Labor to operate the equipment and to mine.
(6) The social and legal consent to pursue the resource.

Five forms of mining, all present in inchoate form during the 1850s, came to co-exist in the region. Placer, quartz, hydraulic, and drift mining all sought the gold buried in one form or another of rock or alluvium. The fifth type of mining sought the limited amounts of other minerals and building stone. Adjustments to satisfy the six conditions for each form of mining and the spatial changes that resulted are the subject of this chapter.
Placer Mining

Traditional placer mining continued to steadily decay during the period 1860 to 1880, while other forms of mining used advances in technology to exploit new resource zones. Added to the competition of new strikes, not only in the American West but elsewhere in the world, was competition from other forms of mining. They did not allow the freedom and individuality of placer mining. But they more than made up for these in stability of income.

Placering fell mainly to two types of people, the part-time by choice and the Chinese by segregation. Americans and Europeans considered placer resources insufficient to warrant full-time mining. However, many farmers and service employees engaged in placering either seasonally or for a few days now and again when crops required little attention or business was particularly slow. For the struggling small farmer, the bits of remnant placer gold could supply desperately needed capital for seed, tools, perhaps even luxuries. An especially fortuitous opportunity became available when a stream was diverted to flood the fields for deposit of new topsoil. This freed the river bed for some quick placer operations that could result in lucrative returns (Darlington 1863).

Most of the gold still taken by the primitive methods of placering fell to the Chinese. The Chinese miner continued to make up a significant portion of the population
and the work force (see Chapter 6). Prejudice against foreigners by Americans and against Orientals by all white miners, however, precluded the Chinese from advanced forms of mining. By legal and illegal methods, local districts prevented Chinese from holding claims and ran them off any finds of sufficient quality to excite white interest. Instead, the Chinese usually mined tailings and worked-over areas that had been abandoned by American and European miners. They continually amazed white observers with their ability to eke out a survival from these poor sources.

Placer mining had built the region, brought the people, excited the country and the world. Within two decades, however, it fell to the disadvantaged and the alternately employed. Placer gold as a population support was but a memory. The gold rush was over, and now a region still heavily dependent on gold settled down to search for methods of adaptation and a continuation of successful development.

**Quartz Mining**

Quartz mining, unlike placering, expanded in production and geographical extent through the early decades of post-Comstock adjustment. From 1860 to 1880 great strides were made in meeting all six conditions necessary for the success of the industry. Pre-Comstock reverses were overcome. Mines
were reopened and worked with new capital, new organization, and new technology. Success and wealth came to the people and regions who controlled the lucrative mines.

General knowledge of the existence and richness of quartz gold was common early in the golden era in California. It did not take the observant placer miners long to follow the trail of alluvial gold upstream and through gravel ridges to the outcrops of auriferous rock from which they came. High grade ore was discovered and mined at Gold Hill near Grass Valley in June 1850. Later that year the first gold quartz claims, some 60 by 120 feet in size, were located in Amador County. These early strikes paid so well that, for a time, miners feared that gold would lose its value (Logan 1948; 33). The existence of major gold vein areas was established by the mid-1850s. Most important were the rich belts in mid-Nevada County around Grass Valley, and the famous Mother Lode farther south.

Despite the general knowledge of auriferous zones, locating actual paying ore was a difficult procedure that usually depended more on luck than on science. Contemporary reporter and historian John Hittell chronicled several peculiar instances of accidental strikes and concluded with the terse observation that, "chemists, geologists, mineralogists and old miners have not done better than ignorant men and new-comers. Most of the best veins have been discovered by poor and ignorant men" (Wells 1880; 181). Writing in
1886, he further advised prospective quartz seekers to be aware of the following in their searches:

1. If a ravine is rich in gold to a certain point and barren above, look for a quartz vein in the hill-sides just above the placer where the richness ceases...

2. A line of pieces of quartz rock observed in a hill-side probably indicates the course of a quartz vein...

3. If a ravine crosses a quartz vein, fragments of the rock will be found in its bed below...

4. A large quartz vein will often show its presence in the topography of the county, by forming hills in those spots where the rock happens to be very hard...

5. Quartz can be found and the veins traced with comparatively little labor in the steep banks of canyons where the rock is bare or is covered with but little soil...

6. If a quartz vein contains gold, some of the metal may be perceptible to the naked eye (Ibid.).

These suggestions illustrate the common-sense, trial-and-error pragmatism brought to the search for quartz gold in California. There are, however, no suggestions in the list to use geological knowledge to aid in the elusive quest.
The need for extremely rich ore to warrant investment created problems in locating and mining quartz gold. This requirement for high grade ore was due to two characteristics of the infant quartz mining industry—unsophisticated, small-scale mining and milling methods and a substantial loss of gold due to waste and technological inability to extract it. Early quartz miners used hand tools such as picks, shovels, and double-handed drills. The latter required two men, one to turn the drill bit and one to pound it with a sledge hammer. Blasting powder was occasionally used to loosen rock. With such a dependence on human labor to mine the ore, labor costs were high, particularly while placering still offered a viable alternative.

Early methods of milling were also small in scale and inefficient. The first equipment used for crushing of rock came to California from Mexico. The "arrastra" consisted of:

"a circular track of stone tolerably level with a low wall around the outside of the track; and in the center a post made of a tree cut off at the required height, and generally just above a crotch or arm; another small tree is then cut in the shape required, for making a horizontal shaft; to this is attached one or more large stones; and these being drawn around by donkey or mule power, grind the quartz
to powder" (Egenhoff 1949; 111-113).

Up to 50 pounds of ore could be crushed in a large arrastra at one time. A variation on this from Chile was the "Chile mill" which substituted a heavy stone wheel for the large stones (Ibid.; 115).

The stamp mill, a European invention that had been used in the Appalachians some years earlier soon replaced these primitive techniques. The following is a description of a stamp mill provided by Rodman Paul (1947; 134):

"The stamp mill was not unlike a huge, mechanized version of a druggist's pestle and mortar. It consisted of a mortar, in which was placed the material to be crushed, and a heavily weighted pounder, called a 'stamp'. The 'stamp' was a long, upright stem upon the lower end of which was placed a heavy iron head. The stamp rose and fell in response to the turning of a power driven shaft to which it was geared by means of a cam. The cam kicked the stamp up to the top of its cycle, then released it so that it might fall with a crash upon the material in the mortar. The force of gravity brought the stamp's weight down with a pressure sufficiently great to cause solid rock to crumble into powder."

The early mills had square wooden stems and square iron shoes. The stamps generally weighed 250 pounds each,
although both smaller and larger ones operated in the Sierra goldfields (Logan 1948; 33-34). A number of men were required to feed the ore into the stamp mill and, while not as highly paid as miners, contributed to the enormous labor costs attendant to this branch of the mining industry.

Gold was extracted from the crushed ore by two principal steps in the early years. Initially, the crushed rock passed through a sluice much as if it were a placering operation. Later, mercury was added to the pans and sluices in order to save more gold. This element amalgamated with the gold and increased the weight of these lumps for easier collection. Subsequently, the amalgam was heated in a retort and the mercury would be evaporated leaving free gold.

These steps were inefficient and often not cost effective for several reasons. Wage rates were high, and both mining and milling required many workers. In addition, the amount of gold saved from the ore was very low. Some estimates place the proportion of gold saved at between a fifth and a third of the total amount contained in the rock (Paul 1947; 139). Also, in almost all ores part of the gold was enclosed within metallic sulfides and was not released by the amalgamation process. Particularly in ores more remote from oxidation that might reduce this phenomenon, the occurrence of "sulphurets" was substantial. As much as one-third of the gold could be locked up in this way (Ibid.; 291-292).
With such high costs and difficult conditions for success, many early quartz mining ventures failed miserably. Extravagant investment that accompanied a gold strike was a large part of the problem. The spirit of boom-time California still pervaded the goldfields and cautious business sense was rare in quartz mining. Companies made large investments, set up mills, and undertook mining on the basis of a few superficial assays and without sufficient surety of resources. Most common was the unfortunate fallacy created by striking a rich chimney, or narrow vertical vein, of gold (Yale 1899; 4). Mine management by men ignorant of quartz mining added to this problem. Many companies believed that all a mine needed was a good administrator, like any other business. The following excellent example from South Dakota shows both the nature of the problems of overinvestment and managerial ignorance and that they continued to occur throughout mining regions for years to come:

A vein was found in 1879 by two brothers who worked the surface with moderate success. In a few months they sold to an Eastern company. Though mine development was superficial, a 40-stamp mill was rushed to completion, a large force of men employed, and work went ahead full speed. An administrator from the East, who had never seen a gold mine before was sent out to manage the affair.
Naturally, the mine failed. The mill was dismantled and moved elsewhere. A year or two later, a practical experienced miner took over the claim and began working on a small scale. Upon discovering that the ore was low grade but sufficient to constitute pay rock, he began his small operation and has expanded successfully (Mining and Scientific Press, 1899; 457).

These unwarranted investments and subsequent failures labelled quartz mining as a risky business. The disappointments and economic ruin occasioned by these quartz mine failures led to widely publicized tragedies, including a number of suicides by men "driven to distraction, and aggravated beyond endurance by the complaints of (their) partners" (Bean 1867; 49). Quartz mining successes were also well known, particularly in the rich fields around Grass Valley and Nevada City. There, ores paid up to 80 dollars per ton. But for every success, there were several dismal failures leading to ruin and infamy.

Despite such adversity, the hard rock mining industry was slowly recovering from a period of near-collapse in the mid-1850s when news of the Comstock discovery reached California. The incredible richness of the Comstock lode was fully determined by the fall of 1859, and in the next spring the majority of the ablest and most energetic quartz miners left the Sierra Nevada for richer ground. Extremely
heavy rains in the winter of 1861-1862 contributed severe flooding to the problems that beset the lode mines in California. Most closed by the end of 1862, including many of the lucrative Grass Valley mines. Repair and pumping of mines was costly, took several months, and allowed no returns during these procedures. Because most mining companies were small and dependent on day to day production for investment capital, the competition from Nevada and these economic problems were often too much to overcome (Ibid.; 50). Mining engineer and geologist William Ashburner reported 280 quartz mills in operation in California in 1858. By 1861, he found only "forty or fifty mills in successful operation, several of which were at that time leading a very precarious existence" (Wells 1880; 182).

Recovery

Born of this adversity and competition, however, were the means and the knowledge to tackle successfully the quartz lodes of the Central Mines and other California goldfields. After five years of superficial success, resource decline caused panic in a wary stock market and sent the Comstock mines into depression and a general shutdown. Unemployment in Nevada became widespread, and many miners began returning to California in 1865. With them came technical, managerial, and operational improve-
ments that were to transform and revitalize California quartz mining. The Nevada experience demonstrated the worth and facility of gold extraction from low grade ores. Larger scale equipment and investment were the answers. Miners also learned more about paying veins and ledges, about digging and tunneling in search of them, and about the general geological conditions surrounding the presence of gold in other material.

Numerous improvements advanced the technical aspects of both mining and milling. Prior to the Comstock, miners thought it financially unfeasible to sink shafts below the level of a few hundred feet. Labor costs, difficulties with timbering, ventilation, and pumping of water, and the use of limited hoisting equipment made deep mines like those of Europe seem wasteful and unremunerative. Returning Comstocks brought new methods of ventilation, shaft boring, and new steel hoisting equipment, as well as the confidence and willingness to sink deep shafts in search of pay ore. At the same time, "Giant Powder" or dynamite replaced expensive gunpowder for blasting. Shafts could be sunk at a fraction of the previous cost with the use of this new blasting agent (Paul 1947; 289-292). Mines were rarely deeper than 300 feet prior to 1860. Shortly after the return of Nevada trained quartz miners, a half dozen mines in the Grass Valley and Sutter Creek districts drilled to depths of greater than 1000 feet (Logan 1948; 33-34).
One of the fundamental technological innovations in Nevada was the square-set method of timbering. Developed by Philip Deidesheimer after some months of trial-and-error, it became the standard and safest method of timbering mines the world over.

Paul (1963; 64) described square set timbering as follows:

Timbers were mortised and tenoned at the ends so that they could be fitted together to form hollow cubes, each cube interlocked with the next in endless series. In large underground chambers some of the hollow cubes could be filled with waste rock, as to make a solid pillar of wood and rock from floor to roof.

He has called this innovation the most significant mining technological development of the 1860s. Timber costs were extremely high and eventually its use was discontinued in some places such as South Dakota. It remained the principal method in California, however, due to its safety and relative economy (Storms 1911; 119).

In 1868, the air drill was introduced to California quartz mines, although its acceptance was not complete until nearly 30 years later. The use of dynamite and improved drills led to greatly increased speed of underground development and ore removal. This reduced labor costs
but not without angry protest from local mine workers. But for the continuing timidity of mine owners, the antipathy of the organized labor movement, and the curious reticence of Cornish miners to adopt some new methods, mining would have proceeded at an even faster and more successful level. An example of the latter factor was noted by a reporter to the *Mining and Scientific Press*. Crosscutting was an exploratory "stoping" or digging of an horizontal tunnel at right angles to the vein being followed. It became standard procedure in the later nineteenth century. However, it was reported that "when the Cornish miners got onto a streak of ore, they would stick to it till hell froze over, and never by any chance drive a cross-cut to find out if they had missed anything" (Rickard 1916: 238).

The innovations in mining techniques and equipment suddenly increased the amount of ore being blasted, dug, and hoisted from these new, larger mines. Much of the increased payload was lower in gold content than that which had been mined earlier. Because advances in milling paralleled those of mining, mills could handle the increased ore production. Stamps were enlarged from 250 pounds each to an average of 800 pounds (Figure 2-1). Some stamp-mills for the larger mines of Grass Valley and Sutter Creek even employed 1500 pound stamps in batteries of from 20 to 80 (U. S. Census 1880b: 248). Most of these huge mills
Figure 2-1: Interior of a stamp mill in Nevada County showing several batteries of heavy stamps, plus sluices and amalgamating pans. Photo courtesy of Nevada County Historical Society.
operated 24 hours per day creating a din that could be heard for more than a mile in all directions. A twenty stamp mill, operating full time, required at least fourteen men as rock-breakers, battery feeders, amalgamators, and engineers. A larger mill might require only a few additional hands but even a small, five stamp mill could not run with a much smaller force than the above. The usual crew was five men working a ten hour shift (Ibid.; 242).

Mill-men employed a technique known as wet-crushing whenever possible. They mixed the ore with water as it went into the stamp mill. This saved wear and tear on the battery and kept down the dust that inevitably accompanied the crushing. Some ores were so soft that a slime was created that leaked out of the mill. Dry-crushing was preferred in these cases (Ibid.; 247-248).

Miners also devised new methods of attacking the stub­born sulphurets. The process of chlorination had been first introduced in Grass Valley in 1858, but not accepted. Its practitioners perfected it on the rich Comstock silver ore, so that by the early 1860s it was available for use in California. The process depended on the fact that metallic gold is dissolved by chlorine gas, while the metallic oxides or chlorides with which it is associated in roasted ore, are unaffected. According to Bean (1867; 181-182), the process worked as follows:
The ore is first roasted in a furnace of proper construction, and then enclosed in a covered vat, into which chlorine gas is introduced, until all the gold is converted into chloride of gold; and then the vat is opened and filled with water, which dissolves the gold as sugar is dissolved under similar circumstances. The solution is drawn off, and the metallic gold precipitated from it by the introduction of the photosulphate of iron. The cost of the entire process does not exceed $20 per ton; and in some locations where wood is cheap and freights moderate, it may be worked as low as $12 per ton of sulphurets.

The method was painstaking and had to be error free. It was a new step in gold production in California, a step toward the use of science and skill and away from the haphazard, unrefined methods of the early placerer.

The amount of gold extracted by the new mining and milling methods approached 90 percent of the total, a dramatic improvement from the early 1850s. The amount of gold necessary to make a ledge of quartz workable decreased from an average of 30 dollars per ton in the early 1860s to an average of approximately 20 dollars per ton in 1869 (Rickard 1916; 237). Miners worked ores of even lower grade in some areas.
Technological advances and expanded production demanded supplies and equipment that earlier quartz operators would not have dreamed affordable. A constant supply of wood and timber, rope, cable and canvas, coal and charcoal, powder, candles, tools, pieces of machinery, and sundries flowed into the mines. The Amador Consolidated Mine in Sutter Creek reported in 1874 that its greatest supply cost was for wood, timber and lumber, accounting for a total of more than 35,000 dollars (Table 2-1). Because of high supply and labor costs, the dividends from this highly successful mine were only eleven percent of the production. Most important, whether this mine had struck a long vein of paying ore, or simply thousands of cubic years of worthless rock, the expenses would have continued at this level. Gold mining was not only a costly business, even in the most successful regions, but a risky one.

The need for supplies required transportation improvements to be maintained by the four counties. The extensive wagon road network established by the placer miners continued to be heavily used in the mining areas. Most miners side-stayed local businessmen and operated their own freight teams and wagons. Exclusion of middlemen and proximity of supply centers such as San Francisco and Sacramento held prices low for manufactured supplies like machinery, tools, cables, and powder. Most water and wood resources came from independent companies, or individuals, but
TABLE 2-1: DISBURSEMENTS AT THE AMADOR CONSOLIDATED MINE, 1874*

<table>
<thead>
<tr>
<th>Mine</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>$110,386.67</td>
</tr>
<tr>
<td>3604 Cords Wood</td>
<td>21,651.12</td>
</tr>
<tr>
<td>Lumber</td>
<td>1,656.34</td>
</tr>
<tr>
<td>Timbers</td>
<td>10,958.80</td>
</tr>
<tr>
<td>Charcoal</td>
<td>948.67</td>
</tr>
<tr>
<td>Hardware</td>
<td>5,141.90</td>
</tr>
<tr>
<td>Wire Rope</td>
<td>4,221.36</td>
</tr>
<tr>
<td>Rope</td>
<td>9,582.62</td>
</tr>
<tr>
<td>Powder and Fuse</td>
<td>5,187.86</td>
</tr>
<tr>
<td>Other</td>
<td>7,207.11</td>
</tr>
<tr>
<td>Total</td>
<td>$176,942.45</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eureka Mill</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>$17,002.72</td>
</tr>
<tr>
<td>Castings</td>
<td>6,011.17</td>
</tr>
<tr>
<td>Quicksilver</td>
<td>1,466.40</td>
</tr>
<tr>
<td>Coal</td>
<td>3,049.42</td>
</tr>
<tr>
<td>Water</td>
<td>480.00</td>
</tr>
<tr>
<td>Wood, Lumber, Shingles</td>
<td>883.66</td>
</tr>
<tr>
<td>Other</td>
<td>2,032.28</td>
</tr>
<tr>
<td>Total</td>
<td>$30,925.65</td>
</tr>
</tbody>
</table>

| Labor at Closed Rose Mill     | $150.00        |
| Total Freight Costs           | 4,840.40       |
| Cost of Working Sulphurets    | 3,891.97       |
| General Expenses              | 13,607.32      |
| Total Expenses                | $230,357.79    |

Total Production               | $270,014.93    |

*(After: Raymond, 1875)
occasionally mines were supplied by their own employees or by subsidiary companies.

Labor was the largest cost for the quartz mines, despite a decline in the wage rate. From 1859 to 1880, the cost of a man for a ten hour shift dropped from five to 3.25 dollars. A foreman's wage in 1880 was still five dollars per shift. Quartz miners had to be more skilled and knowledgeable than placer miners, and the work itself was more difficult and dangerous. However, this also was a time when alternate sources of mining income posed less competition (U.S. Census 1890b; 35).

As they had in Nevada, Sierran miners quickly organized labor unions, particularly among the Cornishmen at Grass Valley and Sutter Creek. The Cornish carried out damaging strikes in 1869 and 1871 to protest the introduction of dynamite and labor-saving air drills, the use of Chinese labor, and to demand a standard minimum wage. Strike breakers were used, beatings, shootings, and police action occurred, and generally the strikers fell into considerable disfavor with the local populace. In the end the strikes failed to prop up the wage rates, which fell to barely two dollars per shift by the turn of the century and failed to stop adoption of labor saving devices such as the air drill. They did, however, succeed in ousting Chinese labor from the quartz mines (Paul 1947; 324-333).

Owners cited the necessity for continued operation
regardless of production as the reason for lower mine wages. A quartz mine could not be readily abandoned in favor of a new, more promising site, as in the case of early placer diggings. Very few quartz mines escaped having to operate occasionally at a loss. Also, a new mine could not be hastily assembled for each new find-of rich ore. Capitalists, the media, and the population in general held that the mines were good for the region, good for the people, and that labor should adjust to conditions in mining like everyone else. One early mining editor and expert wrote the following in 1882:

Such is the spirit of envy and suspicion between labor and capital, that the former is apprehensive of treachery forgetting that they are sisters, closely allied in interests, and labor but a helpless cripple without the strength of her more independent sister. Actuated by suspicion, she bustles all over with false ideas of her own value, holds her mines at very unreasonable estimates, and boastingly asserts that capital shall not control them without extravagantly large returns. This antagonism provokes timidity, and labor is compelled to hug her poverty still closer (Roche 1882; 7).

Despite the fact that the writer unquestionably favored the owners, this presentation of management’s side certainly encouraged antilabor opinions among the non-mining populace.
The fact that most miners were of foreign birth and continued to maintain their Old World cultural habits did not help their cause.

Opening and operating a quartz mine required an enormous capital outlay, despite the declining wage rate, the development of lower cost machinery, and the growth of vertically integrated supply systems. The return of capital and prudent managerial methods and personnel was equally as important as the return of skilled labor and the arrival of new mining and milling technology from the Comstock. Early mines had operated on a day to day basis, paying for improvements and drilling with the profits from recent work. The immediacy and frequency of failure was alarming. After the Comstock, quartz mining was characterized by cautious and intelligent development and a willingness to invest in mine development with a good but perhaps delayed chance of realizing a profit.

Nevada County historian H. L. Wells, writing in 1880 (p. 182), provided the following advisory admonitions for parties intent upon quartz mining. They illustrate the experience and caution being exercised in the later formative years of quartz mining:

1. Gold quartz mining is one of the most uncertain of all occupations;

2. No amount of experience, scientific knowledge, and
prudence, will secure the investor against loss in it;

3. Many of the men engaged in it are very bold, and their statements must not be accepted without great caution, even when there is proof of their sincerity;

4. No one should risk more in gold quartz than he can afford to lose without serious inconvenience;

5. The presence of large lumps of gold in a vein, is no evidence of a profitable mine. Most of the best mines have had little rich rock; and the finest specimens have come from mines that are not now worked. It is the large supply of paying quartz, and not the extraordinary richness of small pieces, that makes the great mine;

6. There is no occupation in which it is easier to waste money by inexperience, carelessness, or folly;

7. No business has greater need of the presence and constant attention of an economical, attentive, and capable manager, directly interested in the business;

8. For persons of small means, the only safe way to work a quartz mine is to make it pay as it goes along, and to abandon it whenever the returns decline;
9. Many of the best quartz mines in the State were rich at the surface and have yielded more than enough from the beginning to pay for all the work expended on them;

10. Not one in five of the mines which did not pay at the surface, and has been worked to a depth of one hundred feet, has ever paid;

11. The richness of a vein at one point is no evidence of its richness at another;

12. Not one quartz miner in a thousand has made a moderate fortune;

13. Nearly all the owners of the rich quartz mines of California are capitalists, who made money in other business, and then could afford to risk considerable sums in ventures which they considered uncertain;

14. Do not build your mill till you have opened your mine, and got enough pay-rock in sight to pay for it;

15. A good quartz mine, well managed, is the most profitable and satisfactory kind of property to be found in California.

Ready capital was especially necessary during the crucial period of exploration for paying veins, when investment was considerable and returns limited. The San Francisco and Stockton Mining Company in Placer County pro-
vides an example of these initial expenses. A shaft, measuring three by nine feet, was dug to a depth of 197 feet before economic ore was found. The costs included 1500 dollars for timbering, 3000 dollars for an engine to raise gravel and water, and 12,500 dollars for labor. After assays revealed that the ore was rich enough to warrant mining, a further 10,590 dollars were spend in digging a 500 foot tunnel for drainage and ventilation. Therefore, before any returns from mining could be realized, the company had expended more than 27,000 dollars. This figure would have been many times larger had not the mine already had infrastructure in the form of mills, roads, and buildings in place at nearby shafts (Angel 1882; 224).

With capital expenditures so great and the risks of failure still significant, quartz mining naturally gravitated into the hands of fewer companies and increasingly became the property of distant capitalists rather than local entrepreneurs. California correspondents reported in 1865 that local rather than external capital was behind the recovery of Grass Valley quartz mines. However, by the mid-1870s New York and London capital, while not approaching the importance of San Francisco investment, made sizeable inroads into the financial scene of California mining (Bancroft 1880b; Vol. 1, 816). California quartz mines, however, resisted incorporation and stock exchange listings as practiced in Nevada. As late as 1874, the Mining and Scientific Press (1874; 3) reported:
It is a significant fact to mention that the majority of the good quartz mines of the State are in private hands and pay well enough in themselves, without the necessity of the owners having recourse to stock jobbing operations. Several of the California street operators own quartz mines and mills in this State which pay them steady profits from one year's end to the other, and they are shrewd enough to keep such properties in their own hands. Even when they are incorporated the stock is held by a few owners who have no desire to sell.

This low turnover showed the relative success of California mining ventures and the stability of production once capital expenditures had been made.

When a mine did close due to lack of remunerative ores, its fate depended on the faith and financial solvency of the owners. In some cases, the owners allowed time to pass and reopened the mine when conditions of supply and labor seemed more favorable. More often, they sold out, either to a new company or, as the years wore on, to nearby competitors. The remaining mine companies, thus, grew progressively larger, and their operations assumed greater significance to the entire Sierra Nevada mining industry. Both the benefits and the dangers increased as these companies expanded their holdings. By increasing their economies of scale, they were able to explore widely for
paydirt and tolerate enormous losing ventures in search of successful operations. But, if one of these colossal mine companies failed, an entire county could be thrown into a depression. Just such an event occurred briefly in Nevada County in the late 1870s when the huge Empire and North Star mines were both closed due to insufficient yields (Bohakel 1980; 6-7).

The aforementioned Empire Mine in Grass Valley provides an excellent case history of a large mining company and the results of decades of competitive strength and acquisitive policies. In his brief history of the mine, California historian Charles Bohakel (1980; 1-34) chronicled the following events.

1850 -- discovery of the initial Empire Claim
1851 -- sold to several local investors
1852 -- the owners failed due to poor management and the mine was put up for auction. The newly founded Empire Company and one J. P. Rush each purchased half the mine.
1854 -- the Empire Company bought out Rush
1864 -- two new investors bought the mine
1867 -- San Francisco capitalists bought the expanded mine
1870 -- fire destroyed the mill and mine buildings which were hastily rebuilt
1878 -- the mine was closed, ownership acquired by a W. B. Bourn Jr., and in 1883 it was reopened
1883 -- adjacent claims began to be purchased and by
1890 the Empire mine was following several
ledges in various directions.
1892 -- purchased the Rush and Laton ore shoots
1893-1899 -- the mine operated at a loss because of
a "barren zone" encountered at the 1500
foot level.
1912 -- acquired the Pennsylvania Mine, itself nearly
as large as the Empire operations.

The mine survived fires, strikes and a shutdown of better
than five years. It not only operated at a loss for seven
years, but later bought out a large, adjacent competitor.
The Empire Mine faced several stock transfers and all the
adversity that plagued the industry through those years.
But, it was founded on rich ore, had a history of capable
and energetic owners and managers, and, at the end of
nearly 70 years of operation had produced close to thirty
million dollars worth of gold bullion (Lardner 1924; 118).
By prudent and cautious expenditures, faith and continuing
effort when returns were very low, and solid capitalist
expansiveness, the Empire Mine served as a model of success
for the quartz industry in the Central Mines region.

The results of this sort of corporate consolidation can
be suggested by assembling several bits of statistical data
for Nevada County. Levick (1911; 27) estimated that from
1849 to 1911 Nevada County produced 275,000,000 dollars
worth of gold. Wells (1880; 176) estimated that from 1849 to 1880 the county produced 105 million dollars in placer and tertiary gold and 54,800,000 in quartz gold. Since placer mining and hydraulic mining declined severely after 1883, we may estimate the total placer production at 115,000,000 dollars. This leaves a total quartz production of 160,000,000 dollars to which we may add an estimated 20,000,000 dollars for the years 1912 to 1918 based on reports to the State Mineralogist. Of this estimated total quartz gold production of 180,000,000 dollars from 1849 to 1918 for the entire county, 108,406,000 dollars or 60 percent is accounted for by ten Grass Valley mines (Lardner 1924; 113). Clearly, mining rapidly became a very big business in which the old time prospector and gold panning placerer were neanderthalic memories.

Evolution of Quartz Claim Laws

Quartz mining demanded satisfaction of one further condition in addition to high labor, capital, and supply requirements. Beginning in 1866, a series of laws were enacted defining exactly the nature and permanence of various sorts of mining claims. These took a cloudy and potentially damaging issue and firmly established the laws by which mining properties still operate in this country. It was no accident that this occurred precisely at the time when the quartz mines of California were undergoing renova-
tion and redevelopment.

The method of acquiring and holding a claim in California was derived from Spanish mining and English common law plus adaptation to local conditions. In the early years of the gold rush, miners developed laws by trial and error in several hundred different locations. Because miner mobility rapidly diffused workable ideas, these rules were remarkably similar throughout the state by 1868, despite the existence of more than 500 districts (Browne 1867; 226). The accepted norms of this self-government of land claims is summarized in the following list:

(1) Upon discovery of a rich gold region and movement into the area of sufficient miners, a meeting was held to delimit a mining district and establish laws by which claims therein could be acquired and worked.

(2) A district recorder was elected to keep track of claim ownership.

(3) When an unclaimed tract of auriferous ground was discovered, a claim was filed by which the discoverer and no other was entitled to work that land.

(4) Claims were equal in size within a single district but varied slightly between them depending on the richness of the region. Claims of 100 square
feet were common. Generally, the discoverer of a new mining district was allowed to hold twice as much as later arrivals.

(5) Additional claims could be acquired only by buying out someone else. No one could hold more than one claim by this process of location.

(6) The privilege to work a claim lasted as long as the miner actively mined. Usually this meant no absences of more than three days except in the case of illness or other mitigating circumstance.

(7) Upon abandonment of a claim, the land reverted immediately to the public domain. Ultimately all land belonged to the federal government.

(8) Mining was considered the most valuable form of land use and miners could move onto farmland or other lands in search of minerals, regardless of other developments.

(9) Any disputes over claims were arbitrated by a locally designed district court composed of either an elected jury or an appointed one. Observers regarded these courts as extremely businesslike, competent, and fair.

(10) Finally, various discriminatory acts against foreigners, particularly Mexicans and Chinese, found their way into these district regulations. Some prohibited claimholding but most imposed a
"foreign miner's tax (Shinn 1885; 248-269: Paul 1947; 215-218).

The quartz mining industry presented new problems because many owners were not willing to invest large amounts of capital in a venture governed by such limited and impermanent regulations. A convention was held as early as 1851 to draw up regulations for the quartz industry that would apply statewide. It failed, as did a number of subsequent attempts (Paul 1947; 217-218). A number of opinions were expressed both in California and in Washington, D. C., about how this unique portion of the public domain should be handled. The main bone of contention was whether the existing system should be continued or whether the land ought to be sold to miners and the proceeds used for worthy causes by the state and federal governments. Local correspondent George Gordon, writing in 1859 (p. 9), presented the case for status quo, lauding the system whereby if a miner ceased to work his claim, "his right terminates and the mining ground he claimed, divested of private proprietorship, remains, as he found it, a portion of the general fund, open to the next comer." California historian Hittell (1866; 437) presented the opposition's case remarking, "The ill-regulated society and unsound condition of business in our state, are traceable mainly to the insecure tenure of our lands; and as a necessary means to attain social, commercial, and individual health, we must have
Beginning in 1865, California miners, local officials, and politicians engaged in a series of legal battles that culminated in the Act of 1866. This act defined for quartz miners the methods of acquiring and holding land claims and the legal rights and restrictions associated with these holdings. It established three fundamental principles:

(1) That all the mineral lands of the public domain should be free and open to exploration and occupation;

(2) That the rights and rules that had evolved under the system of districts were valid and recognized by the government; and

(3) That titles to some of the mineral lands held by the old system of claims might be obtained permanently by their occupants with payment of five dollars per acre plus the costs of surveying and recording (Paul 1947; 231-232).

The Act of 1866 also defined the width and length of lode claims. The legal ramifications of following a vein of ore were defined as well. In 1872, an amendment established quartz claims to be a maximum of 1500 feet in length and 300 feet on each side of a mineral vein. In addition, the owners of a tunnel also received the rights to all veins or lodes within 3000 feet of the mouth of the tunnel.
These acts established both the worth and legal validity of the California mining district regulations and the subsequent right and ability of claim holders to acquire permanent title to tracts upon which they had invested heavily for quartz mining purposes. The newness of these laws and the high costs and intricacies of filing for permanent mineral patents daunted most miners initially. However, in 1873 the number of quartz patents filed in California doubled to 169 and the number rose steadily thereafter (Ibid.; 234). The passage of these laws gave confidence to mine owners that title could be acquired when production and assays warranted it. With permanent title assured, capitalists could invest freely in quartz mining ventures without fear of losing their claim through a legal loophole or administrative oversight (Shinn 1885; 248-257).

Distribution of Quartz Mines

In summary, the Comstock experience resulted in a number of advances in California quartz mining. A new breed of miner, with better techniques and knowledge, returned to California to pursue the deep gold resources of the Sierra Nevada foothills. Shafts were sunk deeper in search of the elusive mineral. Bigger and more efficient mills, innovative tools and blasting materials, and lower labor costs allowed greater amounts of material to be
worked. These mills resulted in a decrease in gold per ton necessary to operate profitably. Large capital inputs and improvements in equipment were required, but with Comstock experience and new faith in the local resource, they were available from wealthy individuals and corporations. Skill and knowledge returned greater profits to many fortunate owners. The Acts of 1866 and 1872 dispelled lingering doubts of ownership and permanence of claims. California quartz mines continued to suffer from financial vagaries and individual failures from time to time, but by the late 1860s, it was basically a growing and healthy industry, employing fewer but stabler and more skilled employees, that faced the remainder of the nineteenth century.

Statistics on production and distribution are both rare and partial. Nevertheless, some idea of the growth and distribution of quartz operations can be assembled from secondary sources and these limited statistics. Geologist William Ashburner reported 40 or 50 quartz mills operating in the entire state in 1861 (Wells, 1880; 181). The State Agricultural Society (Transactions) reported 145 mills in the four Central Mines counties alone in 1869. In addition, most of these mills were much larger in capacity.

State Geologist Charles Yale made the only attempt at a comprehensive list of mines prior to the twentieth
century. In 1882, Yale listed 707 mines of all types for the Central Mines counties. Comparison of the locations of these mines with major quartz and gravel deposits indicates that between 330 and 380 of these were quartz operations (Map 2-1).

Most of the remunerative quartz mines were concentrated in two areas. One centered on the towns of Grass Valley and Nevada City. It became the leading quartz mining district in the state. Not only were there numerous claims and mines located in and around the two cities, but many of the largest and most successful producers in the West worked these valuable ores. When statistics on gold production by county began to be compiled in 1880, Nevada County led the state. It held this position for the rest of the century and beyond. More than 80 percent of this enormous production by Nevada County during that time was in quartz gold (Yale, 1899; 40).

The second major quartz mining area was along the Mother Lode, a series of parallel veins stretching some 120 miles from Mariposa County to Georgetown, in El Dorado County. The richest portion of the Mother Lode was the area between Jackson and Amador City in Amador County. The ores here, although, not so rich as those in Grass Valley, were extensive, and encouraged many of the state's largest mines to locate there. From the early days of quartz operations, mine claims were bunched along the
MAP 2-1: DISTRIBUTION OF MINES, 1882

(AFTER: YALE, 1882)
Mother Lode like a tightly strung necklace (Map 2-2). This area not only maintained its productive capacity throughout the later nineteenth century, but actually led Amador County past Nevada County for a few years after 1909. Other quartz mines were located along the remainder of the Mother Lode and in a few other locations such as Ophir and Volcano, but the Mother Lode and Nevada County were the centers of this resurgent industry not only for the Central Mines region, but for the entire state.

Thus, while placer mining continued to decline in employment and production, the quartz industry prospered. Returning miners brought new inventions, laws, and money. The new quartz miners vied for the position to inherit and carry the legacy of gold mining in California. With the capital and technology that returned from Nevada or developed thereafter, they did just that.

**Hydraulic Mining**

The *State Minerologist* (1880; 47) defined hydraulic mining as "the art of extracting gold from gold-bearing detritus--i.e., surface deposits, placers, or washings--by means of water under great pressure discharged through pipes against the auriferous materials." Implementation of this technique required several conditions and steps. Water was first brought from its source to a site upslope from the area of be worked. There it was held in a vertical
MAP 2-2: MOTHER LODE CLAIMS

TOWN OF SUTTER CREEK

TOWN OF JACKSON
shaft or tank called a pressure box to build up pressure or "hydraulic head." Miners then directed the water through a hose in a powerful stream, blasting apart the hillside and washing a slurry of material downslope into a system of sluices where the gold was collected. Subsequently, the waste material was disposed of into a local stream or later, as the scale of operations increased, to a more distant river by way of a series of canals.

The development of hydraulic mining was similar to that of quartz mining up to 1880. Once knowledge of the resource was common, various primitive methods were used to extract it. Only an extraordinarily rich gold content allowed early success by these means. Technological and capital problems later threatened to halt hydraulicking, but improvements made during the Comstock rush revitalized the mines.

The existence of substantial deposits of gold in Tertiary gravel ridges was widely known as early as 1850. Rodman Paul (1947; 147) credits recognition of the resource to Nevada County Cornishmen. They promptly sank shafts into the hillsides and pursued the former river deposits by tunnelling along in these coyote holes. This method of attack developed later into drift mining.

The most successful method of gold extraction, and the true predecessor of hydraulicking, was ground sluicing. This process required running a ditch of water to a point
atop the ridge to be mined, digging a trench down the hillside and allowing the water to flow down through the gold bearing gravel. Any number of men could then stand alongside and shovel material into the artificial watercourse. The gold and other heavier material would settle along the bottom, while silt and sand would be washed away. The settled material subsequently passed through an ordinary sluice to extract the gold (Egenhoff 1949; 91). The key feature of ground sluicing was the use of running water to do most of the work of breaking down material and separating the gold. Because it also required artificial systems to bring water to the mine, long sluice boxes, and some means of disposing of tailings, it was the technological as well as methodological ancestor of hydraulicking.

Two innovations transformed ground sluicing into the dramatic hydraulicking technique that was to revolutionize mining. In 1852, a Frenchman in Nevada County employed a hose to bring water to the hillside for sluicing. The flexibility of the hose allowed movement of the watercourse from one site to another without expensive reconstruction of flumes. A year later, American miner Edward Matteson conceived the novel but simple idea of attaching a nozzle to the hose and directing a powerful stream of water against the hillside. Thus, California's most important contribution to mining was born (Paul 1947; 153-154).

The method was an immediate and resounding success. The labor savings was instantly apparent, and in this instance
California miners showed none of the reticence to accept innovation that they did in quartz mining. Miners immediately enlarged water systems and installed new equipment wherever Tertiary gravel mines operated. Virtually all the mines enjoyed immediate success. Towns sprang up or recovered from placer decline, and fortunes boded well for gold mining along the ancient courses of the Sierran streams.

The requirements for hydraulicking were relatively simple, and labor and equipment inexpensive once the new technology was available. Canvas hoses, an iron nozzle similar to those used on fire hoses, wooden sluices, and long toms (Figure 2-2) were all the equipment needed at the mining site. The capital required for equipment was minimal as compared with quartz mining, despite frequent replacement of burst hoses and worn sluices. Labor requirements were also smaller. After initial construction of flumes, sluices, and ditches for tailings disposal, a small crew of five to ten men could operate the mine, directing the hose, cleaning or working the sluices, and overseeing the entire process.

Although hydraulicking requirements for labor and machinery were modest, the extravagant use of water was expensive. Water was brought to the mining site by extensive ditch and flume networks which had to maintain an elevation above the mining site in order for the water to move and the mine to operate. Hydraulic mining
Figure 2-2: Sluice system for hydraulic mining, near North Bloomfield. Photo courtesy of the Nevada County Historical Society.
escaped large capital needs for labor and infrastructure, but paid dearly for these water systems. Many undertook construction of their own water supply systems. Labor for building these networks was expensive and demanded large investments before mining could begin. Most small companies could not afford these costs, but an alternative became available. Independent companies formed to build ditches and flumes and sell water to all interested parties. Thus, relatively small mining companies could purchase water from a ditch company and defer water costs until daily gold extraction began supplying funds. Local miners combined their financial resources and claims to work the Tertiary gravels to the limits of their financial ability. Hydraulicking, in the mid-1850s, was characterized by small operations, local investment, and primitive equipment. Despite these handicaps, it enjoyed expansion and success during the first half decade after Matteson's invention.

Problems arose in the later 1850s, however, that for a time, threatened to halt hydraulicking. The most serious became apparent when miners washed off the top layers of gravels to find that the lower gravels were densely compacted due to the weight of the overburden. Water from the hoses could not disturb this material, and the amount of gold contained therein did not justify expenditures for blasting powder and the labor required to use it. Efforts
to strengthen water flow through better hoses were unsuccessful and hydraulicking was restricted to the upper gravels.

Added to this were continuous increases in the cost of water. Miners had to seek farther and farther afield for water for the insatiable hydraulic mines, resulting in rising construction costs. Ditch companies needed numerous laborers for the building and frequent repair of ditches and flumes. Wages had to match those of mining which remained high after the glory days of placering. As costs for water rose the burden was heavy on marginal mines. Incidents of mine company failure became more common, and the minimum grade of workable gravels became higher. Angry miners engaged in strikes, riots, and vandalous destruction of flumes and ditches, resulting merely in still higher costs (Kelley 1959; 27-32).

Two events of catastrophic effect exacerbated these problems. First the Comstock discovery siphoned off a large number of ditch workers and miners. The hydraulic mines, already in trouble, were abandoned, and the water companies could not hold enough labor to repair and extend their systems. Towns declined, businesses closed, and this sector of the mining industry had as much cause to cast envious eyes to the east, as did quartz and placering operations. Even more crippling was a severe drought that plagued California from 1862 to 1864. Because water
supply to all regions was reduced, ditch companies were forced to go even farther afield for sources. Water prices inflation accelerated and more mines had to close.

Recovery of Hydraulicking

Hydraulic mining, with its low investments, was inherently suited to quick recovery, however when times were better. The break in decline occurred in the years from 1864 to 1866. A series of developments culminated at that time to alleviate each of the significant obstacles. Heavy rains for several winters replenished the snowpack, and Sierran streams swelled with water. At the same time, labor in the form of disappointed Comstockers and capital from former Nevada entrepreneurs flowed into the old mining grounds where a few hydraulickers still operated small mines. Returning miners rebuilt dams, repaired flumes, and reopened mines with much of the excitement and optimism that had characterized the early days of hydraulicking.

Improvements in technology during the short period of decline were even more important. A series of complementary inventions led to the creation of the "Little Giant" or hydraulic monitor, a cannon in structure and appearance. This solid iron contraption (Figures 2-3, 2-4) was mounted on a ball joint for ease and range of movement. It directed a huge stream of water at a hill, blasting
Figure 2-3 (above): Hydraulic Monitor Near North Bloomfield

Figure 2-4 (below): Hydraulic Mining Near North Bloomfield. Both photos courtesy of the Nevada Historical Society.
apart scores of cubic feet of material per minute. Two or three men could manage it. This solved the problem of concentrating high pressure water without bursting the hose and allowed the miners to attack the compacted material scores of feet below the hill surfaces (Report of the State Mineralogist 1880; 65-58).

The methods of extracting gold from the slurry were also upgraded. Steel gratings, installed in the path of the water and detritus, blocked boulders. Enlarged systems of sluices extended, in some cases, for thousands of feet. They were augmented by separate systems for sluicing the debris a second time. Entire companies formed to work tailings, many of them manned by Chinese. Some hydraulic companies employed men to rework the deposits. These improvements raised the percentage of gold saved from the gravel, even as the amount of material excavated and washed increased more than tenfold (Ibid.; 70-88).

The result of these improvements and the rekindling of interest was the advance of hydraulic mining to new economies of scale. San Francisco capitalists, upon realizing the opportunities, invested heavily, and hydraulicking companies increased their size and holdings. Although many small operators still worked the rich gravels, enormous conglomerates formed, controlling ditch systems, hydraulic and drift mines, and in some cases lumber companies. Exploration and the periodic working
of marginal material became feasible due to larger capital reserves.

One remaining requisite for the full resumption of hydraulicking was overcome in 1870 with the extension of the new laws governing mining lands to placer and hydraulic claims. The Act of 1870, much like its predecessor four years earlier, allowed claims to be held in federal land provided they were worked regularly. This again confirmed the practices worked out by early placerers through trial and error. In addition, like the early quartz act, it made provisions for purchase of the mineral claims. With increasing costs and investment of effort and development, this was regarded as crucial to furthering the development of a stable and confident hydraulic mining industry. Placer claims up to 160 acres per individual or association could be patented. Some companies, such as the North Bloomfield, eventually came to own many times this amount through various purchases and mergers (Shinn, 1885; 248-257).

The distribution of hydraulic mines was limited by the constraints of its resource and technique. Only areas of Tertiary gravels where water could be brought to a point above the mine, and where relief allowed easy disposal of tailings could be worked. Nevada and Placer counties contained most of these zones. Hence, increased production was due to enlargement and increase of mines in these areas, rather than diffusion over a wider area (Map 2-3).
MAP 2-3: HYDRAULIC MINING CLAIMS, FOREST HILL DISTRICT 1882

PLACER CO.

TOWN OF FOREST HILL
The primary areas of hydraulicking in the Central Mines region were along San Juan Ridge (Map 2-1), around Nevada City, in Little York township in Nevada County, and around the Placer County towns of Iowa Hill, Forest Hill, and Dutch Flat. Subsidiary hydraulic zones were scattered elsewhere in these counties and near Placerville in El Dorado county (Averill, 1948; 26).

Hydraulic operations, like quartz mines, benefitted from new technology, laws, capital, and enthusiasm among investors. They were a source of wonder to contemporary observers. Literally millions of cubic feet of the Tertiary ridges were carved out and milked of their precious gold. Hydraulicking was the most efficient and exciting method of gold extraction ever employed in California.

Ditch and Flume Companies

Ditch systems for water transfer were the most important infrastructure in the Central Mines region. With the expansion of hydraulic mining in the decade from 1870 to 1880, the demand for water was great. In this case, the region was ready to accommodate demand. Ditch companies had built enough miles of flumes and ditches to supply not only hydraulickers, but also quartz mills, lumbermen, farmers, and residents. The development of this system was the outcome of another process of domestic,
trial-and-error problem solving, and the results were wonders to observers and users alike. The rise and spectacular success of the ditch and flume system in the Central Mines bears special explanation due to its crucial role in all forms of land use.

There were two separate problems to overcome in supplying water in the Central Mines. The first was the movement of water from areas of surplus or minimal use to areas of high demand. The second was the incorporation of a body of laws to govern fairly the use of this resource. The earliest miners attacked both with their usual degree of inventiveness and common sense. Unfortunately, the results in the long run were mixed.

Problems of water supply began as soon as some miners arrived too late to procure streamside claims in a successful mining district. Diversion of water was the solution. Soon, short ditches appeared throughout the areas where claims were numerous. Ground sluicing and later hydraulicking called for more water and larger systems which resulted in specialized ditch companies.

Ditch companies faced many problems in delivering water to consumers in the area. The great relief of the Central Mines region presented considerable engineering difficulties. Water moved, wherever possible, through ditches or canals dug into the earth. They were safer, cheaper, more easily repaired, and less given to leakage than other
methods. But, the uneven topography required careful route planning to ensure proper gradient. Ditches snaked along the ground following the contour. Particularly on sharp turns, bracing and lining of ditches with timber were sometimes required to prevent excessive erosion of the ditch and collapse (U.S. Census 1880b, 224). Because the water had to be kept at a level sufficient to allow movement by gravity, flumes or wooden aqueducts were frequently used for conveying water across canyons (Figure 2-5), in areas where the grade could not be maintained by a ditch, or where hard rock made ditch construction too difficult (Ibid.; 227). Trestles, some more than 100 feet in height over canyons, supported flumes that ranged from one by two to six by eight feet (Ibid.; 227-230). Seasonality of rainfall posed another problem to ditch companies and their customers. Summer drought in this Mediterranean climate resulted in a runoff that fluctuated considerably between winter and summer. Water companies with sufficient capital solved this problem by extending their canals up into the mountains, capturing more tributaries and montane streams, and finally by building large dams for reservoirs. The Eureka Lake and Yuba Canal Company, for example, by 1876 controlled hundreds of miles of ditches and canals, plus several large montane reservoirs (Map 2-4). Subsequent developments further expanded the network of dams and reservoirs in
Figure 2-5: Flume carrying water along San Juan Ridge in Nevada County. Photo courtesy of the Nevada County Historical Society.
MAP 2-4: WATER DIVERSION SYSTEM, SAN JUAN RIDGE

TERTIARY GRAVELS
CANALS OR DITCHES
MINING DISTRICT
the high Sierras. At present, California has the most extensive water distribution system in the world. Mining and its ditch systems, not agriculture and irrigation, provided its genesis.

Construction and maintenance of a ditch system was expensive. Browne (1869; 201-204) reported that 91 ditches and canals in the four Central Mines counties, extending 2302 miles, cost in aggregate 6,119,000 dollars, or 2658 dollars per mile. Several ditches exceeded 200 miles in length and the expense of construction to an individual company was staggering.

Ditch and flume repair and leakage added to these costs. The El Dorado Water and Deep Gravel Mining Company, for example, reported costs for repairs and cleaning at 800 dollars per month for its 40 mile ditch (U.S. Census 1880b; 227). The amount of water lost to leakage and evaporation from just four reporting ditches in El Dorado and Placer counties was between 3,658,900 and 5,135,900 gallons per hour, an enormous loss of resource and, hence, profit (Table 2-2).

Labor also created a significant expense. Ditch construction required hundreds of workers, and even at 1.30 per day for a Chinese laborer, the costs were high. Ditch and flume systems subsequently required superintendents, ditch builders, foremen, and a sizeable staff of ditch tenders for repair and preventive maintenance. Such
<table>
<thead>
<tr>
<th>District</th>
<th>Line</th>
<th>Gallons Carried Per Hour</th>
<th>% Lost to Leakage</th>
<th>% Lost to Evaporation</th>
<th>Total % Lost</th>
</tr>
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<tbody>
<tr>
<td>Georgetown</td>
<td>California</td>
<td>8,400,000</td>
<td>5 to 10</td>
<td>20 to 30</td>
<td>25 to 40</td>
</tr>
<tr>
<td>Georgetown</td>
<td>El Dorado</td>
<td>2,800,000</td>
<td>15 to 20</td>
<td>20</td>
<td>35 to 40</td>
</tr>
<tr>
<td>Georgetown</td>
<td>Park Canal</td>
<td>1,540,000</td>
<td>5</td>
<td>15 to 20</td>
<td>20 to 25</td>
</tr>
<tr>
<td>Gold Run</td>
<td>Gold Run</td>
<td>1,505,000</td>
<td>10</td>
<td>8</td>
<td>18</td>
</tr>
</tbody>
</table>

*Information from U. S. Census 1880, Volume XIII, Precious Metals, pp. 220-221*
laborers were perforce paid as highly as miners, usually three dollars per day, further adding to the burden on the ditch companies.

After overcoming the obstacles encountered in construction and the enormous expenses, water companies had to devise an efficient distribution method. Water was measured for sale by the unusual method of the "miner's inch." This was defined as "the quantity of water that will pass through an orifice one inch square under a head of six inches above the center of the orifice... equal to 11\(\frac{1}{2}\) gallons per minute or 1/40 of one cubic foot per second" (Robertson and Nelson 1915; 353). A wooden box or tube, placed at the ditch bank, measured distribution at each point. It required careful maintenance for accurate measurement and pricing.

Ditch companies charged different amounts for miners, farmers, and others. The U.S. Census (1880b; 238) reported that an El Dorado County ditch company charged from two to three times as much per miner's inch to quartz mills as it did to hydraulic mines and three or four times as much for irrigation water. This was due to the scale of demand. Hydraulic mines used many times more water than any other consumer and, indeed, were the backbone of the entire water transfer industry.

Ditch companies often tried to use water again after it re-entered the system. "Second Water" was cheaper than "first water" but was naturally available only to
users at lower elevations. The Amador Canal and Mining Company, for example, sold first water to quartz mills, a lumber company, and others and second water at lower costs to lower elevation copper mines, quarries, and farmers of western Amador County (Table 2-3) (Stretch, 1879; 12).

As in the cases of quartz and hydraulic mining, the extensive infrastructure, high costs, risks of failure, and necessity for large expenditures before profit encouraged larger companies. The pressing needs to expand into the higher Sierra Nevada further accelerated consolidation. Large companies and ditches bought out small ones and worked their ditch systems into larger networks.

The trends for ditch companies in the Central Mines were, therefore, representative of the economic institutions with which they were associated. Like quartz and hydraulic mines, water companies expanded their resource base spatially, up-graded their infrastructure, and moved toward corporate consolidation. The basic water system had been largely established, however, by the time of the Comstock discoveries. Observers reported that by the late 1850s water was available virtually anywhere in the mining areas (Siolo, 1883; 104-110). In fact, despite extension of ditches to new alpine sources, the number of miles of operating ditches actually decreased from 1859 to 1877 from 2977 miles to 2570 (Transactions, State
TABLE 2-3: SOURCES OF INCOME, AMADOR CANAL AND MINING COMPANY, 1878

First Water

<table>
<thead>
<tr>
<th>Monthly Rates</th>
<th>Months</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lincoln</td>
<td>$ 402.27</td>
<td>8</td>
</tr>
<tr>
<td>Talisman</td>
<td>350.00</td>
<td>12</td>
</tr>
<tr>
<td>Keystone</td>
<td>578.33</td>
<td>12</td>
</tr>
<tr>
<td>O. Amador</td>
<td>403.00</td>
<td>12</td>
</tr>
<tr>
<td>Bunker Hill</td>
<td>203.50</td>
<td>6</td>
</tr>
<tr>
<td>Gover</td>
<td>443.07</td>
<td>12</td>
</tr>
<tr>
<td>Potosi</td>
<td>350.00</td>
<td>3</td>
</tr>
<tr>
<td>Centennial</td>
<td>400.00</td>
<td>2</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>41.35</td>
<td>5</td>
</tr>
<tr>
<td>Oneida</td>
<td>734.65</td>
<td>12</td>
</tr>
<tr>
<td>Kennedy</td>
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<td>6</td>
</tr>
<tr>
<td>Monterichard</td>
<td>350.00</td>
<td>7</td>
</tr>
<tr>
<td>Con. Amador</td>
<td>354.00</td>
<td>11</td>
</tr>
<tr>
<td>Moon Gravel</td>
<td>------</td>
<td>--</td>
</tr>
<tr>
<td>Means Gravel</td>
<td>------</td>
<td>--</td>
</tr>
<tr>
<td>Lumber Company</td>
<td>------</td>
<td>6</td>
</tr>
<tr>
<td>Water Works</td>
<td>50.00</td>
<td>12</td>
</tr>
<tr>
<td>Sundries</td>
<td>------</td>
<td>--</td>
</tr>
</tbody>
</table>

Second Water

<table>
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<tr>
<th></th>
<th>Monthly Rates</th>
<th>Months</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newton Copper</td>
<td>75.00</td>
<td>12</td>
<td>900.00</td>
</tr>
<tr>
<td>Fulcher</td>
<td>135.00</td>
<td>4</td>
<td>540.00</td>
</tr>
<tr>
<td>Ione Gravel</td>
<td>125.00</td>
<td>4</td>
<td>500.00</td>
</tr>
<tr>
<td>Irrigation</td>
<td>------</td>
<td>--</td>
<td>300.00</td>
</tr>
</tbody>
</table>

Total Second Water $ 2,240.00
Total First Water 53,348.55
Total Income $55,588.55
Agricultural Society, 1878). Removal of duplication by consolidation was part of the reason. In 1878, as in the 1850s, an observer of El Dorado County was able to write: "Flumes and ditches exist all over El Dorado County, water can be supplied to anywhere in any quantity and is available for agricultural irrigation at a very low rate" (Bancroft 1880b; Vol. 1, 880). Water was equally available in the other three counties throughout the period of adjustment and change in the mining industry.

The laws governing water use were subject to the same uncertainty and lack of precedent as those of mining claims. Miners developed a body of rules for water in the same fashion as they did for mining, by experimentation. Eventually, these laws served not only in the California mining territory, but throughout most of the western states. The miner's doctrine of prior appropriation was based on an assemblage of law and tradition from English common law and Spanish law and colonial practice. It held that the right to use of running water went to the first user regardless of the amount taken. Several provisions had to be met, however, including:

1. He must post a conspicuous sign stating his claim;
2. He must record his claim with the proper officials;
(3) He must use the water for a beneficial purpose and relinquish his claim when he stops;
(4) He must replace the water after diversion and use it without diminishment of amount;
(5) He cannot divert the water if it injures others (Mining and Scientific Press 1899; 477).

These provisions came about after voluminous litigation concerning each step. Indeed, California became the national leader in water law controversy (Miller 1973; 9-14).

The ditch companies, with this body of water law, could legally divert entire rivers for gold extraction. They often did. Water was eventually replaced well downstream, often with a tremendous load of tailings accompanying it. Suits over water use, the rights of ditch companies to build their canals across mining ground, and the rights of farmers to unsilted waters, plagued local and state courts. Not until near the end of the century was California able to break the tradition of water law based on mining claim precedents and format. Only then could it equitably supply water to its new leading industry--agriculture.

Miners, thus, were able to solve the problems of water supply and rights in the same fashion they solved problems in the mines. Lack of technology did not hamper ditch construction so their development in the mining zone was
spatially complete by 1859. Thereafter, extension to new, dammed sources, consolidation of companies, and efficiency of operation increased dramatically on the model of Nevadan experience. The water industry was just another example of how far the Central Mines region had progressed from the small-time, individualistic economic functions of the Gold Rush period.

Drift Mining

Drift mining, or "coyoting," involved tunneling into a ridge and following a seam along a former stream bed in a method similar to coal mining. It was practiced either where gravel deposits were overlain by lava, or where the paying portion was concentrated in a thin stratum of two or three feet lying directly upon bedrock beneath many feet of worthless material. Hydraulic washing was impossible in the first case due to the impervious caprock layer, and unprofitable in the second case due to the paucity of paying material.

Location of the ancient river bed was the key to successful drift mining. Drift miners sometimes sank a vertical shaft to bedrock and then cross-cut along that surface. More commonly, they drove a tunnel into the ridge from the side, again following along the interface between the bedrock and gravel deposit, until auriferous material was found. Upon location of this seam or "lead" of gold-
bearing gravel, mining procedures closely resembled quartz mining. Removal with hand tools was the mode where gravels were soft enough. In harder material, blasting powder and cement stamp mills similar to quartz mills were employed. Square-set timbering, pumping and ventilation equipment, and underground tracks and ore cars reinforced the similarity of drift mining to quartz operations (U.S. Census, 1880b; 205).

Drift mining was as expensive and financially risky as quartz mining. Many drift mining companies experienced the same sorts of setbacks due to dependence upon day to day production for capital. The onset of emigration to the Comstock, however, did not affect the drift mining industry as severely as it did other forms of mining. While hydraulic and quartz mines suffered from technological problems, this branch of gold mining remained a viable alternative during the early 1860s. Drift mining worked material that was inherently easier to mine and mill than quartz and contained gold in a form familiar to placerers. It progressed steadily from the mid-1850s until 1870 when hydraulicking usurped its function in many areas (Bean, 1867; 58-59). Drift mining thereafter remained an option to take whenever hydraulicking was not feasible.

Although technology was sufficient throughout the history of drift mining, many operations were unable to meet the capital requirements, due principally to a high
labor cost when compared to hydraulicking. Miners dug horizontal tunnels or "stopes" of several thousand feet, removed gravel and extracted gold by hand. Cross-cutting and digging of drainage and ventilation shafts increased the labor and capital input. Therefore, small partnerships did most of the work during the Comstock years. Later, large corporations, some of which also owned ditches and hydraulic mines, entered into drift mining. Cheaper labor and more available capital from nearby hydraulic mines allowed establishment of larger operations (Stretch 1879; 51-57).

The costs of drift mining were directly related to the hardness of the material. Extremely compacted material forced the use of blasting powder and cement stamp mills and slowed the miners' progress substantially. Alternatively, if the material was too soft, expenditures for timbering and pumping could be prohibitive. The federal census for 1880 (1880b; 205) reported that conditions varied so widely that where gravel yielding one dollar per cubic yard might return a handsome profit at one site, gravel containing five or six dollars per cubic yard might fall short of expenses elsewhere. Like all mining ventures, drifting mining was subject to luck as well as hard work and prudent management.

The premier drift mining areas in the Central Mines region were in Placer County, near Gold Run, Yankee Jims,
and other famous hydraulicking zones. In addition, Little York township in Nevada County and parts of El Dorado County also came under scrutiny and development by ambitious drift miners. Enormous tunnels could be found particularly in Placer County, where the Hidden Treasure Mine held a claim in excess of 10,000 feet yielding nearly 300 dollars per linear foot (Ibid.). Exact statistics of the number of tunnels and total length in miles are lacking, but estimates of contemporary mining observers suggest that the Central Mines region may have had several hundred tunnels totaling in the hundreds of miles (Steele 1961; 38-43). The U.S. Census (1880b; 205) further estimated that one-third of all the alluvial gold product in California came from drift mining in 1880. Considering the investment and growth of hydraulicking at this time, this is a remarkable amount.

Drift mining, therefore, existed alongside the more impressive hydraulic method, extracting the same resource by a more limited and prosaic method. Labor and capital intensive, it benefitted from its role as the backup to hydraulicking along the Tertiary gravel ridges. As a methodological hybrid of the mining industry, drifting prospered and bided its time, always there to claim a share of the gold in the Central Mines region.
Other Minerals and Materials

Gold mining consumed the attention of local residents and visitors throughout the 1850s and was the basis for the regional man-land system. But, as interest waned in the diminishing placer gold supply, other products, both mineral and non-mineral, were sought as substitutes. Among those discovered and exploited were copper, iron, soapstone, and various building materials such as marble and granite. The final category of mining addressed in this chapter differs, therefore, not by method of extraction but by resource.

These resources were distributed widely through the eastern portions of the four study area counties (Map 2-5). The minerals were formed by the same processes that caused the great gold veins and occur generally in the same areas. None of these products approached in quantity or worth the enormous auriferous deposits but each contributed to the evolution of mining toward a more stable, diversified resource base. None, however, could replace the lure, the population support, indeed the regional "raison d'etre" provided by gold.

Copper

The story of copper mining in the Sierra Nevada foothills in many ways represents the events and factors that influenced the Central Mines region through the second
MAP 2-5: LOCATION OF OTHER MINES AND QUARRY PRODUCTS OF THE CENTRAL MINES
half of the nineteenth century. A surprising, almost accidental, discovery was followed by a brief boom of interest and development. Miners, money, and supplies poured into the copper mines, and within months the industry was bustling in a dozen locations. Copper is a base metal, however, and lacked the fixed value of gold. A decreased national demand and the rise of competition led to lost fortunes, disappointed miners, and closed mines. It began with a boom as did the Central Mines region and eventually succumbed to competition and the inability of its resource base to support an overbuilt infrastructure. Eventually, the industry adjusted to new conditions and operated successfully on a much smaller scale. The copper experience, coming at the time when the placer gold decline was hardest felt, was another tough lesson for the residents of this mining region.

Although methods of mining were similar to those of quartz gold, the pursuit of copper was not undertaken in the 1850s. Knowledge of minerals other than gold was limited to a few experienced miners and trained geologists and mineralogists. In addition, as long as the auriferous placers held out no one bothered with this low price base metal. Two events occurred in the years 1859 to 1860 to change that attitude. First, the discovery of the Comstock deflated interest in California gold and raised the possibility of wealth from other metals. The vast silver
deposits in Nevada triggered a search for this and other worthwhile substances in the Sierra Nevada and elsewhere. Second, the onset of the Civil War thrust California into the unfamiliar role of supplier to the North. One of the products California supplied was copper, which was desperately sought for armaments.

Prospectors fanned out along the old placering regions of California and soon established the existence of a significant belt of deposits stretching along the lower Sierran foothills from Nevada County to Mariposa County. According to the *Alta California* (January, 1863), the ensuing boom resounded with the comments "who would have thought it?" and "why did we not know that it was copper?" Incredulity gave way to excitement as miners recognized the material they had discarded in their search for gold, returned to sites of their earlier workings, and invested in new copper developments (*Mining and Scientific Press*, 1862; 5).

Unfortunately for these miners, the copper boom was even more shortlived than that of placer gold. A large investment and population shift had again been based on an insufficient resource base. The following three quotes chronicle the anticipatory excitement, dreaded reevaluation, and disastrous conclusion of this second mining boom:
The recent discoveries of copper in Amador County already begin to affect the interests of its citizens. Activity, enterprise, and prosperity have taken the place of lethargy and dullness that had begun to settle upon the people of that county. The busy hum of labor, and the loud, merry laugh of the successful miner, may again be heard in the gulches and ravines that had long been abandoned to the quail and coyote (Bancroft 1880b; Vol. 1, 74).

The great copper furore (sic), which has monopolized everything else hearabouts [Ione City, Amador County] during the last two years, seems to have subsided somewhat, and many parties who have spent large amounts in prospecting are now pausing and surveying the ground, and some their pockets, and find most of their loose change gone. Others have been more fortunate, amongst whom I may mention the Newton company (Mining and Scientific Press 1865; 407).

... we passed the deserted works of the Newton Copper Mining Company. A few years ago and this mine was supposed rich beyond computation, the fortunate discoverers could have sold out and retired independent; but now the price of copper has declined so materially that it does not pay to
work. This is also said to be the case with several mines in the county (Bancroft 1880b; Vol. 1, 75-76).

The collapse resulted from several factors that affected copper demand. First, with the cessation of hostilities in the Civil War, one of the principal market supports disappeared. Competition from the huge works near Lake Superior was more damaging. These deposits far exceeded, in both quantity and quality, anything California could offer. They were also much closer to the center of the budding American industrial network. Finally, even within California the role of copper supplier was usurped by larger and richer copper deposits near Mount Shasta in the northern part of the state. This combined competition brought Central Mines copper production to a virtual standstill by 1868.

Copper mining did partially recover, however, in the mid-1870s. Some of the large works, such as the Newton Copper Mine near Ione and the Spenceville Copper Mine in western Nevada County, reopened with smaller scale production and local marketing. None achieved anything like the success planned and hoped for earlier, but by operating on a small scale and intermittently when demand was sufficient, copper continued to play a role in the mining profile of the region (Aubury 1902; 162-187).
Iron

The most important bodies of iron ore in California occur along the Sierra Nevada, particularly in a small zone from Auburn to Clipper Gap in Placer County. The cost of transporting the ore to the coastal cities, where manufacturing provided a market, however, made it impossible to compete with cheaper imported iron ore. Even later, when coal was mined regularly near San Francisco Bay, the resources were insufficient to warrant large-scale improvements for internal iron and steel works. But, these high transport costs to the foothills benefitted local iron mines in supplying local demand. According to Browne (1869; 222), local quartz, lumber, and grist mills in the foothills consumed nearly 2000 tons of cast iron annually. Mines and railroads also used iron for various purposes. Consequently, a number of small smelting works, with capital investments of only a few thousand dollars each, appeared in the Central Mines region. The two principal areas of concentration were along the Central Pacific Railroad near Clipper Gap in Placer County and near Diamond Springs in El Dorado County (Ibid.; 221-224). Unlike copper, the iron industry started small, with little fanfare, and developed on a scale appropriate to demand. Iron never caused the rush of interest and personnel that gold and copper shared. By the same token, it never experienced the catastrophic economic decline that
Building Stone

While copper and iron were being developed in the early 1860s, attention was also directed toward building stone, particularly marble and granite. Rich discoveries were made in the years 1865 to 1868 confirming that the Central Mines contained valuable materials of all types. Particularly productive was a strip of territory coincidentally along the railroad right-of-way in Placer County. Quarrymen found several types of granite at Penryn and Rocklin on the edge of the Central Valley, marble and limestone near Auburn, and high quality black and white marbles at Colfax. The latter brought to an end the marble trade with Italy and the ingenious but curious practice by local Italian immigrants of securing passage by bringing a large, rich piece of marble to the ship with them. The voracious building industry of San Francisco consumed most of the product. California gold and Nevada silver made the City a home for neowealthy whose ambitions included ostentatious homes on Nob and other hills. Browne (1869; 241) estimated the consumption of marble in San Francisco at 500 cubic feet per month, about 80 percent of the demand by the entire state.

The building stone industry employed several hundred men in quarrying and initial polishing of material, pri-
marily in Placer County (Manuscript Census Survey). Many of these, particularly in Penryn and Rocklin, were Finnish and Scandinavians. In addition, a number of teamsters hauled the heavy stone to Sacramento and elsewhere. Quarrying, like several other types of mining, was an unassuming and low profile industry, but one that nonetheless contributed to a decreased dependence on gold.

Other Materials

A few other minerals and products of relatively little import financially or in terms of employment bear mention. Each played a small role in the diversification of resource base in the Central Mines region. Soapstone or steatite, a hydrated silicate of magnesia, was the most important. Local mines used it for insulation in furnaces and ore-reducing equipment and several San Francisco factories used it in the construction of such products as soap, paper, fireproofing material, cosmetics, and headstones (U.S. Census 1890b; 739-741). It occurred in insignificant amounts throughout the Central Mines, but a large and profitable deposit was located near Placerville. Several sizeable soapstone claims, including one of 3000 by 363 feet, were worked in this area.

Among the other products successfully mined or quarried in the region were roofing slate in Amador County, clay near Grass Valley, kaolin in Amador and El Dorado counties,
and sandstone in a variety of places in the Central Mines. None of these products employed more than a few dozen men at any given time. None could contribute significantly to the income and financial livelihood of the region. But, the fact that they were sought by the region's residents, including many former placerers, shows the immense changes that had befallen gold mining as the resource base and population support for the area.

Conclusion

Mining was subject to a variety of problems and influences during the twenty years following the Comstock discovery. Each of the five major forms of mining felt the pressure of labor competition and capital investment restraint. Each differed in adaptability and ability to satisfy the conditions of successful mining. Six conclusions can be derived from the information presented in this chapter. First, gold miners progressed from easy to difficult gold resources. This was the result of technological improvements and the rapid depletion of the easily extracted material. Placer mining declined drastically and never recovered. Its capital and technological requirements were few, but this very simplicity led to the rapid exhaustion of the resource. Quartz and hydraulic mining both initiated expansion based on rich, easily worked material. Both forms of mining declined when faced with seemingly unworkable ore
and gravel bodies, and for a time, appeared doomed. With advances in technology, both recovered to lead the region in production, employment, distribution, and importance.

Nevada competition only temporarily damaged local mining and resulted in advances which enabled many of the subsequent mining operations to take place. Quartz mining benefitted most from inventions and improvements at the Comstock mines, but hydraulicking and drift mining also gained from improvements in sluicing, timbering, labor skills, and managerial experience. The success with silver in Nevada led California miners to search for other minerals and materials in the Central Mines region. California owes much of its post-Civil War mine production to innovations made by its inventive mineral seekers elsewhere.

Mining expanded spatially to its fullest extent very early after resumption of activities in the mid-1860s. The gold-bearing veins and Tertiary gravels were limited in distribution, and most were known by the early days of California mining. The solution to technological problems unleashed a rapid expansion to all known gold sources and an intensification of mining at each site.

Comstock miners were fortunate to return to a mining area with established towns, roads, and equipment. More importantly, the water critical to all forms of mining was available thanks to the tremendous engineering schemes carried out in the 1850s. Ditch companies suffered along with the mines after the Nevada news had its full impact.
But, like the mines, recovery, intensification, corporate consolidation, and use of less accessible, rich resources led to bigger and better companies and efficient water systems. The groundwork was laid for rapid recovery of mining in its new and more demanding forms.

Ownership of mining operations moved away from small companies and partnerships and toward large companies with outside capital. Even in the vestigial placering industry, larger Chinese owned companies worked the tailings and sifted river banks. Large corporations, owning ditches and canals, lumbering operations, and several types of mines came to control acres of claims and produce hundreds of thousands of dollars in gold every year. This functional integration resulted in much greater efficiency and production.

Finally, mining ceased to be a quickly learned, easily undertaken, individual pursuit. It required fewer but skilled and knowledgeable workers and careful, educated management. Digging and milling quartz, operating hydraulic monitors, and scouring for traces of copper and other minerals called for more than a grubstake and an eye for gold. A new type of miner lived and worked the Central Mines region in 1880.

With these advances in production capability, dramatic changes in organizational and technological structure, and requirements for experienced workers and foremen, mining
settled down to grind out the remaining gold in the foothills and mountains. Stability and permanence were never assured, but the meteoric mobility and day to day fates of early placering were gone. Still, once in a great while an event reminiscent of the days of '49 occurred. Workers sifting through dirt under a Placerville store in 1877 found immense quantities of placer gold. The town had been built early in the rush and this ground had never been worked. For several years, miners contracted with store and business owners to mine under their structures, paying from 500 to 2000 dollars plus 25 to 50 percent of the gold for the rights. They were unable, even with a 10,000 dollar bond, to get permission to dig up Main Street, however (Mountain Democrat 1928; 7).

Mining, thus, adjusted painfully but successfully. Employment dropped significantly. But, it was with fond hopes for a return to the glory days and a continued rise in the region's importance, that locals greeted the last two decades of the nineteenth century. Perception of the future for the region and for mining was almost universally optimistic. Two quotes illustrate the perception of mining's future:

For mining capital, as is said elsewhere, no more inviting field presents itself, and the great success attending those now here is sufficient guarantee to offer to those who would invest their
money in mining property (Amador County Board of Supervisors 1887; 18).

"The great want of Grass Valley is good, permanent, white citizens who will come here and settle with the intention of making this town their home, of seeing their children grow up and settle near them, and of finally having their bones deposited in one of our cemeteries. We do not want men who simply come here to skim off the cream, take it to San Francisco, and leave us the skimmed milk. We want men who, when they get a gold-brick out of mine, will not send it off to the Bay before it gets cold. We want men who will expend their surplus capital where they get it from; who will build up the town; erect manufactories; keep our mechanics busy, our merchants active, our hotels full, our churches and school houses in operation. Home capital spent at home would encourage labor of all kinds (white labor we mean) to come here. Employment would be furnished to hundreds who are now loafing in San Francisco (Bancroft 1880b; Vol. 2, 828)."

Workers and capital were all that were needed according to locals. Indeed, the reappearance of those two elements signalled the rise of mining in its new forms. Mining had
changed forever, and gone with the old ways were the days of hectic strikes and shoestring operations, and the unpredictable excitement of the rush for gold.

The Central Mines region, with the great numerical retreat and technological shifts in its principal industry, faced adaptation in all sectors. Many economic functions existed only as support industries. Each now contended with the disruptive problems of a sharp decline in the region's mainstay. But, each now received an opportunity to expand in its own right. Upon these alternate land use functions depended the future of the California Gold Country.
CHAPTER 3
THE HEIR APPARENT, CHANGES IN AGRICULTURE, 1860 TO 1880

Agriculture in the Gold Region during the 1850s was a small scale industry with few farmers and even fewer full-time ones. The market was entirely local, dependent primarily on mines. Farming was a poor competitor both for labor and land, if not in reality, then at least in the perception of the local, mining-oriented populace. In any conflict over land use, trespass, or water rights, local juries generally decided in favor of mining, and there was no recourse to higher courts for support.

A series of factors came into play with the changes of the late 1850s that profoundly affected local agriculture. Labor became available in the form of ex-miners and new immigrants. Many, if not most, of these men had backgrounds in farming, either in the East or in some foreign homeland. Agriculture was a logical alternative when the going got too tough in placering.

Demand changed as more distant markets became available and local requirements for agricultural produce fell in accordance with the drop in population. The population decrease, although not as severe as is commonly believed, sufficed to cut demand drastically in the early 1860s. Fortunately for local farmers, the Comstock boom occurred in an area much less suited for agriculture than California and even less able to supply itself than earlier mining.
regions had been. Transport links such as the Placerville Wagon Road paved the way to this market. Later, the Central Pacific Railroad established permanent links with markets on both the eastern and western sides of the Sierra Nevada.

Changes in mining claim laws settled questions that had plagued all land users in the region. Land contests continued to swamp the dockets of local and state courts, but a framework and set of precedents had been established to govern competitive functions. In the long run, agriculture benefitted as much as mining from the new laws.

Finally, agriculture became a powerful statewide industry. Farming in the coastal valleys around San Francisco Bay and in the rich Central Valley began to assume monumental proportions. Success after success with familiar staples overcame disappointing setbacks with experimental crops. Production advanced at a startling rate, exploiting distant markets and producing capital for the state that exceeded that from mining by the 1870s. The Central Mines region, as all parts of California, was caught up in the agricultural boom and its own farms were aided by the state's new crops, markets, and promotions.

The combination of these factors and their almost simultaneous occurrence led to a number of changes in Central Mines agriculture which may be grouped into four
major categories:

(1) The number of farms and cultivated acreage increased;

(2) Crop production increased, but maintained considerable intra-regional diversity.

(3) Marketing evolved from a local network to one that sent products outside the region.

(4) The relationship with mining, spatially, legally, and in terms of competition for water resources, evolved favorably for agriculture.

The role of each of these sets of changes in the evolution of Central Mines agriculture was critical. Following a background discussion of statewide agricultural trends, plus climatic and edaphic features in the Gold country, each will be analyzed and explained.

Background to Local Agriculture

Statewide Trends in Agriculture

While the population of the Central Mines grappled with the problems besetting mining, the farming industry of California underwent rapid change. The earliest California agriculture included the pastoral endeavors of the coastal missions and pueblos. Hides and tallow from cattle provided much needed capital for this distant segment of newly independent Mexico. When the gold
rush began, a huge demand for foodstuffs encouraged drives of large herds of cattle into California from the Midwest, Texas, and Mexico. During the 1850s cattle ranching diffused through much of the state.

Flood and drought disasters brought about the second phase of California agriculture. In 1861-1862, rainfall was excessive, and many areas of cattle range in the Central Valley were swamped, drowning some cattle and starving others. Rainfall at Nevada City, which averaged approximately 49 inches per year, exceeded 80 inches during that season. More serious, however, was the drought that affected the state for the next two winters. The magnitude of its severity can be gauged by a rainfall total of 17 inches recorded at Nevada City during the second season, 1863-64. Tens of thousands of cattle throughout the state died of starvation and thirst leaving "thousands of carcasses and heaps of bleaching bones strewed (over) the country which was once good pasture" (Reed 1946; 252-255).

Cultivation of grain in the Central Valley and elsewhere in California had begun in the 1840s. Wheat quickly came to dominate the grains and inherited the role of leading agricultural product when the cattle herds diminished. Wheat farming expanded during the period 1860 to 1890 in a speculative boom sometimes rivalling that of the gold rush itself. Farms of 5000 acres became dwarves alongside the huge tracts in the Central Valley.
Single farms of from 20,000 to 40,000 acres were common. Production rose from six million bushels in 1860 to 30,000,000 in 1880. Valley farmers produced wheat in excess of state and even Western demand and marketed it regularly as far away as Britain. Barley and oats were also grown, but wheat was the undisputed king of California agriculture in the later decades of the nineteenth century.

Production increase and expanded distribution of fruit growing was the third major phase of California agriculture. Value of orchard products tripled in the years 1860 to 1880 from 754,000 dollars to over two million. Most of this expansion occurred in the 1870s when large scale irrigation systems became available. The major fruit growing areas were in and around the Los Angeles Basin for various citrus fruits, figs, and dates, and around San Francisco Bay and the eastern Sacramento Valley for deciduous fruits. This led eventually to a countertrend in farm size toward smaller, irrigated units. The era of greatest growth of the fruit industry did not occur, however, until very near the end of the nineteenth century.

Speculation and experimentation were common in California. Acquisition of huge tracts of land led to speculative ventures, and a few capitalists came to hold land amounting to millions of acres. The wheeling and dealing, high financial risks, and potential for quick and easy profits combined to lend an atmosphere of excitement
and laissez-faire dynamism to large-scale farming ventures reminiscent of the gold rush. It was a high time for agribusiness.

Success with grains and fruit in California, plus other crops familiar to American and European farmers, encouraged experimentation with a variety of tropical and semi-tropical plants. Among the commodities promoted by the State Agricultural Society and tried with almost universally miserable results were coffee, bananas, mulberry trees for silk, pineapples, tea, indigo, and sugar cane. The state legislature appropriated premiums of up to 100,000 dollars for successful planting of these crops and also sorghum, flax, hemp, tobacco, cotton, and rice (Baur 1966; 41-61). The will to experiment illustrated by these efforts quickly diffused throughout the state all the products for which it was to become a leading producer.

Crop and livestock changes, rapid expansion of acreage, and experimentation deeply affected California and the West. Against this background, the agriculture industry in the Sierra Nevada foothills developed and expanded, influenced by state trends but in many ways highly disparate.

Climatic and Edaphic Characteristics of the Central Mines

Before discussing the changes that transpired in Central
Mines agriculture, it is useful to briefly survey some environmental conditions affecting the region. Climate and soil quality influenced distribution, production, and crop choice, and, hence, the role of this industry in the evolution of the Central Mines region. Climate was the most important factor. The climate of the Sierra Nevada foothills promoted the growth of many crops and animals, but also presented limitations that required technology, capital, and considerable effort to overcome.

Temperatures for the important populated areas of the Central Mines (below 4000 feet elevation) are mild. The mean maximum ranges from 90 to 50 degrees Fahrenheit for the summer and winter respectively, while the mean minimum averages 65 in the summer and 40 in the winter. Killing frosts are rare, even in the coldest months. For example, a severe frost in 1885 damaged crops throughout the state, but tomato and other delicate crops along the Central Pacific route near Colfax (elevation 2400 feet) were unharmed (Placer County Immigration Society 1886; 9). The reason is the existence of a "thermal belt" from 1000 to 2500 feet and the location of these crops atop a ridge within this zone. Cold air drainage resulting from winter radiation cooling can frequently drop valley bottom temperatures below the freezing point. Warmer air is displaced upward and usually keeps the temperature above 32° preserving crops in this zone. The existence of such a belt was
familiar to local farmers and promoters who lost no opportunity to acquaint the world with their fortuitous circumstance.

Great variation in elevation and relief within the Central Mines area led to distinct differences in microclimate. Such factors as humidity, winds, aspect, air drainage, and slope caused sharp variation in conditions over short distances. An example is the five-degree difference in mean annual temperatures at Grass Valley and Nevada City. The two towns are at the same elevation, only four miles apart, and have the same mean precipitation total (California Department of Public Works 1955: 16). The growing season varies from four to nine months, depending on the elevation that ranges from 100 to more than 7000 feet in the region.

The temporal distribution of rainfall is of even greater significance than the region's mild temperatures. Most pioneer settlers encountered a winter rainfall-summer drought regime for the first time in California (Figure 3-1). Drought from May through September would severely constrain statewide agriculture but for physiographic and wind conditions that allow and encourage irrigation. The pattern of isohyets for the Central Mines area (Map 3-1) show the effect of the Sierra Nevada barrier on westerly winds in the winter. Orographic precipitation in the form of snow above the 4000 foot level is very high. The mountains act as a natural
FIGURE 3-1:
MONTHLY DISTRIBUTION OF MEAN SEASONAL PRECIPITATION AT SELECTED STATIONS
(AFTER: CALIFORNIA DEPARTMENT OF PUBLIC WORKS 1955, PLATE 6)
MAP 3-1: ISOHYET MAP OF THE CENTRAL MINES AREA (ANNUAL INCHES)

AFTER: CALIFORNIA DEPARTMENT OF PUBLIC WORKS 1955; PLATE 4)
reservoir holding water until the warmer summer temperatures release the precious resource through snowmelt. Though runoff does decrease as fall approaches, the rivers and creeks of the region provide a system of water supply adequate for most crops adapted to the temperature regime and other conditions (Table 3-1). Even in areas where adequate water was not readily available from a nearby watercourse the vast system of ditches and flumes could supply nearly every acre of land in the lower portions of the four counties by 1859.

The considerable relief of the foothills area contributes to variability in soil depth and quality as well as in climatic conditions. Hilltops and hillsides are generally covered with medium to deep primary or residual soils. Most are slightly acidic. They formed from weathered granitic rocks and extend from a few hundred feet to more than 10,000 feet in elevation. On the flats, pocket valleys, and river courses are secondary, or alluvial, soils. These soils are finer and generally better for agriculture than the residual soils, though their mineral content also varies considerably depending on the parent material (Ibid.; 18-21).

The perception of foothills soils was generally favorable during the early years of agricultural development in California. They were considered relatively safe from flooding and deposit of mining debris, rich in mineral content, porous enough for deep-rooted crop trees and plants, and of
TABLE 3-1: ESTIMATED NATURAL RUNOFF OF PRINCIPAL STREAMS, CENTRAL MINES REGION

<table>
<thead>
<tr>
<th>Stream</th>
<th>Station</th>
<th>Drainage Area, Miles</th>
<th>Acre-Feet Mean Runoff, 1894-1947</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yuba River</td>
<td>Smartville</td>
<td>1,194</td>
<td>2,415,000</td>
</tr>
<tr>
<td>Dry Creek (NEV)</td>
<td>Waldo</td>
<td>69</td>
<td>34,000</td>
</tr>
<tr>
<td>Bear River</td>
<td>Wheatland</td>
<td>295</td>
<td>356,000</td>
</tr>
<tr>
<td>Coon Creek</td>
<td>Highway 99</td>
<td>84</td>
<td>30,600</td>
</tr>
<tr>
<td>American River</td>
<td>Fair Oaks</td>
<td>1,921</td>
<td>2,774,000</td>
</tr>
<tr>
<td>Consumnes River</td>
<td>Michigan Bar</td>
<td>537</td>
<td>374,000</td>
</tr>
<tr>
<td>Dry Creek (AMA)</td>
<td>Ione</td>
<td>279</td>
<td>98,900</td>
</tr>
<tr>
<td>Mokelumne River</td>
<td>Clements</td>
<td>630</td>
<td>780,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>5,009</td>
<td>6,862,500</td>
</tr>
</tbody>
</table>

After (California Department of Public Works, 1955; 29)
more than sufficient depth. Repeated claims of superiority over Central Valley soils appeared in agricultural and promotional literature for internal as well as Eastern and foreign distribution. Descriptions such as the following from an 1874 edition of the Pacific Rural Press (Bancroft 1880b; Vol. 1, 82-83), were common throughout the nineteenth century and had an indeterminate affect on prospective agricultural immigrants:

The soil of the foot-hills, where not made up of coarse gravel, (and that is the rare exception) is formed by the decomposition of granite, slate, or lava, with everywhere more or less lime, generally covered with a good depth of loam, underlaid with rocks so broken and porous that the roots of trees, vines, and alfalfa, readily penetrate to perpetual moisture, and find in these deep crevices and very richest of mineral food, principles largely waiting the soil of the great river valleys of the State. No floods destroy the crops or stock there, and mosquitos and land speculators seldom put in an appearance to disturb or annoy the settler.

The Increase and Distribution of Farms

Two of the basic measures of agriculture are the number of farms and the amount of acres they cover. During
the two decades following the Comstock discovery both the number of farms and their acreage increased substantially in the Central Mines. Early haphazard acquisition of farmland was superseded by controlled procedures of official alienation of the public domain. Agriculture thus aided expanded despite the population changes that affected the region.

Land Alienation Methods

Nearly all the land in the Sierra Nevada and its foothills was officially public domain. Amid the confusion of the gold rush and its Jeffersonian democratic local governments, farmers settled and developed some of this land. This occupance was accomplished by two means—squatting and confirmation of a prior Mexican grant. Miners acquired claims simply by beginning work on an unclaimed plot and then reporting their holding to a local recorder. During the gold rush, farmers used the same method to acquire farmlands. Laws for purchase of government lands, on the books elsewhere, were ignored in the goldfields. Because early farms could be overrun by miners at any time, farmers were little inclined to purchase and maintain a permanent holding. Rather, they merely settled some open land, planted crops, harvested, and sold the produce to the local market. The issue of land ownership later arose when the placerers moved on and the threat of destruction from mining
ended. Often newly immigrated farmers contested established holdings. The courts generally confirmed the holding of the earlier settler provided he paid 1.25 dollars per acre under the Pre-Emption Land Law of 1841 (Brown and Shaw 1944; 97-98). Virtually all of the region's 343,218 acres in farms reported in the 1860 census had been acquired in this fashion.

An exception in the early years of land acquisition was the Arroyo Seco grant made by Mexico in 1840 to one Teodore Yerba (or Yorba). According to the decree, this enormous tract contained eleven leagues of land and stretched from the Sierra Nevada into the Central Valley and from the Cosumnes to the Mokelumne rivers, including virtually all of what later became Amador County. A legal contest began with the onset of gold mining and American settlement that continued for nearly twenty years. The case of local businessmen, miners, and squatters against Andres Pico and later J. M. Moss, the subsequent owners of the grant eventually reached the Supreme Court. The inspecific boundaries caused most of the trouble. In 1866, the court decided in favor of the grant holders, but limited the tract to only Township 6 N Range 9 E plus some 250 acres in adjacent townships to the east and north. Still, the grant thus lay squarely in the center of the Ione Valley in western Amador County, one of the richest agricultural regions in the Central Mines. Squatters who had settled
these lands were evicted despite their improvements in one of the rare defeats handed these laissez-faire settlers (Mason 1881; 242-250).

Eventually, this portion of California settled into a more prosaic but rational and problem-free process of land acquisition by official alienation procedures. There were five principal methods of gaining agricultural land. Prior to 1862, the simplest and most common were outright purchase and settlement and subsequent purchase by pre-emption. The latter allowed up to 160 acres of unappropriated land to be acquired provided that:

(1) The lands were known to contain no valuable minerals.

(2) Residence of five years with good faith to develop the land as a permanent home.

(3) One-eighth of the land was in crops by the time of final title.

(4) Up to 1.25 dollars per acre was paid to the Land Office.

The Land Office simply recorded these as "Cash Entries" and once alienated they became the full property of the owner for any purpose.

Acquisition of public land for agriculture became even easier in 1862 with the passage of the Homestead Act. Under the provisions of this Act, up to 160 acres could be
obtained free by a prospective settler provided he met the same conditions of residency and development as those for preemption. If these conditions were not met in five years the land reverted to federal control to be redistributed to a new claimant. One landholder could own a maximum of 160 acres under a homestead patent and another 160 under a preemption claim. Other lands could be purchased from private holders if desired. The homestead method of land acquisition eventually came nearly to replace preemption and other cash purchase methods.

A fourth method of gaining federally controlled lands was in exchange for military scrip. The army of the frontier was poorly supplied and capital for payment of soldiers insufficient. War exacerbated this problem. Tens of thousands of Mexican War and Civil War veterans, like their predecessors back to the Revolution, were compensated for service by issuance of land certificates, usually for 160 acres. These could be exchanged for the allotted land on any unclaimed portion of the public domain. Maximizing its greatest resource, the United States government, issued thousands of these scrip patents through the nineteenth century.

Cession to railroad companies in support of their construction projects was the final method of land disposition. Grants in California consisted of twenty alternate sections (one square mile each) of land on each side of the
line in a checkerboard pattern for each mile of track. In addition, the railroad company received a 200 foot right-of-way on each side for telegraph lines and roads, and all the land necessary for depots, side-tracks, and so forth. If the company could not get acreage along the route to which it was entitled, due to prior homestead or preemption settlement, it could make up the deficiency anywhere within twenty miles of the edge of its land grant (Cooke, 1870). The purpose of donating these lands to the railroads was to provide them with a source of capital through sale to settlers and with future railroad customers through settlement near stations. Many problems beset the Central Pacific during its early years, and it took congressional acts in 1874 and 1876 to solve problems between the railroad and settlers already living along the right of way. These issues, plus competition with homesteading, slowed the sale of railroad lands. Later, though, these lands provided enormous revenue for the fortunate companies. The prices charged per acre in 1886 ranged from one to ten dollars in Placer County, depending on the condition of the land and the proximity to towns, stations, and railroad line (Placer County Immigration Society, 1886; 19-24).

The Distribution of Federal Lands, 1860-1880

Ninety township and range units were surveyed to assess
land alienation in the Central Mines. These aggregate to approximately 1,822,783 acres. The total acreage patented by 1880 was 268,489. This includes all homestead grants, cash entries, and military scrip patents. Patented lands, therefore, made up 14.7 percent of the region's total area. Virtually all of these patents were issued after 1860 (Bureau of Land Management Records).

The distribution of patented lands was very uneven. Many sections were composed of rugged, mountainous terrain unsuitable for any form of agriculture save semi-nomadic grazing. Other townships, in the western sections of the four counties and near large towns, were popular sites for land acquisition (Map 3-2). Patented acreage within a township and range unit ranged from none to over 12,000 with a mean of slightly under 3000 (a township contains approximately 23,000 acres). Six distinct zones of concentration admirably reflect population and economic function distributions as well as suitability of physiography. One spanned a broad territory embracing the big quartz centers of Grass Valley and Nevada City and extending to the lower elevations near Rough and Ready. These towns provided local markets and developed transport systems. Zones two and three were aligned along the Central Pacific Railroad route and exhibit the key role of transport in the region's agriculture.

Zone three also lay near areas of major agricultural development along the eastern flank of the Central Valley.
MAP 3-2: DISTRIBUTION OF PATENTED ACREAGE TO 1880

one dot = 500 acres

NO DATA
Zone four resulted from another transport and population concentration along the Sacramento and Placerville Railroad, the Placerville Wagon Road, and the commercial centers of Placerville and Shingle Springs. Zone five was the largest in extent and encompassed sections of El Dorado and Amador counties in and about the old placer mining areas. Finally, zone six was an area of dense concentration around the rich Mother Lode mines and the big towns of Jackson, Sutter Creek, and Amador City. More than fifty percent of the land in these five township and range units was alienated by 1880. Homestead grants made up one-fourth of these patented lands in the Central Mines and were also concentrated in these six zones.

In addition to these patents by individuals, 152,847 areas were turned over to Central Pacific and Sacramento and Placerville railroads. These further increased the lands privately held in zones two, three, and four. The railroads still held 90 percent of this land in 1886 (Southern Pacific Company 1886). In total, individuals and companies held 421,336 acres in the region, comprising only 23 percent of the total available land, but more than 50 percent of some township and range units in Amador and Placer counties.

Numerous grant failures and land transfers showed that despite the steady increase of patented lands, some confusion and a sense of hesitancy still existed among the
region's farmers. Homestead entries, if not properly developed, reverted to federal government control after the trial period of five years. Up to 1880, thirty-one percent of the region's homestead entries failed for some reason and reverted to the public domain. Areas of high failure rate coincided spatially with the areas of greatest agricultural concentration and production (compare Maps 3-2 and 3-3). The reasons for this coincidence are unclear. They may result from a greater awareness of the part of the Land Office and potential new landowners of failures to meet homesteading conditions in the desirable locations. In any event, farms were begun by people who were either unable or unwilling to manage them.

Numerous land transfers from less fortunate or less able farmers to newcomers or those seeking larger operations also took place. Placer County historian Myron Angel (1882; 437) reported that there were 75 land grants or sales passing land from the government to private holders during one year in the late 1870s. Meanwhile, the county recorded 767 sales or transfers of land between parties. The Placer County Immigration Society (1886; 18) reported almost precisely the same numbers and ratio in 1884.

The use of land as an investment was at least part of the reason for the many land transfers. Farming in the Central Mines was small scale, diverse, and technologically unsophisticated. But, the legacy of quick profit seeking
MAP 3-3: HOMESTEAD FAILURE RATE TO 1880

- >50%
- 31 to 50%
- 10 to 30%
- <10%
- no grants made
from the mining rush plus influence from the Central Valley, promoted land speculation. The agriculture of this marginal zone was more affected than its promoters liked to recognize or its practitioners like to experience.

**Increased Farms and Farm Acreage: The Census Reports**

While the Land Office statistics give detailed and reliable information on the distribution of agricultural and other patents, it is necessary to turn to other sources for data on farms, farm size, and improved farmland. Two primary sources of data are available, the U.S. Census of Agriculture and county reports to the State Agricultural Society. The latter, however, were subject to frequent changes in definition of categories and incompleteness. Hence, the census records provide the best available data and were used whenever possible. County level figures provide most of the data though Placer County figures include two townships not in the study area. Analysis at a finer scale is prevented by numerous inconsistencies in the data.

Four qualities and trends characterized farm size in the Central Mines (Table 3-2). First, Placer and Nevada counties, which began with the fewest farms in 1860, increased most rapidly over the two decades as advantages in transport and mining provided markets, both local and distant. Also, Amador and El Dorado counties were the earliest sites of agricultural development and much of their expan-
<table>
<thead>
<tr>
<th></th>
<th>Amador</th>
<th>El Dorado</th>
<th>Nevada</th>
<th>Placer</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Farms 1860</td>
<td>392</td>
<td>484</td>
<td>152*</td>
<td>254+</td>
<td>14,044</td>
</tr>
<tr>
<td>1880</td>
<td>531</td>
<td>542</td>
<td>356</td>
<td>514+</td>
<td>35,934</td>
</tr>
<tr>
<td>% Change</td>
<td>+35</td>
<td>+12</td>
<td>+134</td>
<td>+102</td>
<td>+156</td>
</tr>
<tr>
<td>Average Farm Size 1860</td>
<td>222</td>
<td>218</td>
<td>*</td>
<td>356</td>
<td>622</td>
</tr>
<tr>
<td>1880</td>
<td>243</td>
<td>244</td>
<td>214</td>
<td>369</td>
<td>462</td>
</tr>
<tr>
<td>% Change</td>
<td>+9</td>
<td>+12</td>
<td>---</td>
<td>+4</td>
<td>-26</td>
</tr>
<tr>
<td>Farms Under 3 Acres 1860</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1880</td>
<td>1</td>
<td>5</td>
<td>---</td>
<td>3</td>
<td>143</td>
</tr>
<tr>
<td>% Change</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Farms 3 - 10 Acres 1860</td>
<td>34</td>
<td>58</td>
<td>14</td>
<td>17</td>
<td>829</td>
</tr>
<tr>
<td>1880</td>
<td>10</td>
<td>11</td>
<td>6</td>
<td>14</td>
<td>1,064</td>
</tr>
<tr>
<td>% Change</td>
<td>-71</td>
<td>-81</td>
<td>-57</td>
<td>-18</td>
<td>+28</td>
</tr>
<tr>
<td>Farms 10 - 20 Acres 1860</td>
<td>54</td>
<td>46</td>
<td>25</td>
<td>20</td>
<td>1,102</td>
</tr>
<tr>
<td>1880</td>
<td>9</td>
<td>17</td>
<td>13</td>
<td>9</td>
<td>1,430</td>
</tr>
<tr>
<td>% Change</td>
<td>-83</td>
<td>-63</td>
<td>-48</td>
<td>-55</td>
<td>+30</td>
</tr>
<tr>
<td>Farms 20 - 50 Acres 1860</td>
<td>95</td>
<td>79</td>
<td>46</td>
<td>61</td>
<td>2,344</td>
</tr>
<tr>
<td>1880</td>
<td>22</td>
<td>33</td>
<td>23</td>
<td>33</td>
<td>3,475</td>
</tr>
<tr>
<td>% Change</td>
<td>-77</td>
<td>-58</td>
<td>-50</td>
<td>-46</td>
<td>+48</td>
</tr>
<tr>
<td>Farms 50 - 100 Acres 1860</td>
<td>72</td>
<td>64</td>
<td>37</td>
<td>55</td>
<td>2,428</td>
</tr>
<tr>
<td>1880</td>
<td>48</td>
<td>58</td>
<td>51</td>
<td>61</td>
<td>3,969</td>
</tr>
<tr>
<td>% Change</td>
<td>-33</td>
<td>-9</td>
<td>+38</td>
<td>+11</td>
<td>+63</td>
</tr>
</tbody>
</table>

(Table 3-2 continued on next page)
### TABLE 3-2: FARM SIZE AND IMPROVED ACREAGE BY COUNTY, 1860 AND 1880 CONTINUED

<table>
<thead>
<tr>
<th></th>
<th>Amador</th>
<th>El Dorado</th>
<th>Nevada</th>
<th>Placer</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farms 100 - 500 Acres</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1860</td>
<td>132</td>
<td>192</td>
<td>30</td>
<td>97</td>
<td>6,541</td>
</tr>
<tr>
<td>1880</td>
<td>416</td>
<td>379</td>
<td>242</td>
<td>329</td>
<td>20,214</td>
</tr>
<tr>
<td>% Change</td>
<td>+215</td>
<td>+97</td>
<td>+707</td>
<td>+239</td>
<td>+209</td>
</tr>
<tr>
<td><strong>Farms 500 - 100 Acres</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1860</td>
<td>5</td>
<td>31</td>
<td>---</td>
<td>4</td>
<td>538</td>
</tr>
<tr>
<td>1880</td>
<td>15</td>
<td>27</td>
<td>15</td>
<td>37</td>
<td>3,108</td>
</tr>
<tr>
<td>% Change</td>
<td>+200</td>
<td>-13</td>
<td>+825</td>
<td>+478</td>
<td></td>
</tr>
<tr>
<td><strong>Farms Over 1000 Acres</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1860</td>
<td>---</td>
<td>14</td>
<td>---</td>
<td>---</td>
<td>262</td>
</tr>
<tr>
<td>1880</td>
<td>10</td>
<td>12</td>
<td>6</td>
<td>28</td>
<td>2,531</td>
</tr>
<tr>
<td>% Change</td>
<td>---</td>
<td>-14</td>
<td>---</td>
<td>---</td>
<td>+866</td>
</tr>
<tr>
<td><strong>Total Farmland</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1860</td>
<td>86,829</td>
<td>105,492</td>
<td>*</td>
<td>90,289</td>
<td>8,730,034</td>
</tr>
<tr>
<td>1880</td>
<td>128,831</td>
<td>132,163</td>
<td>76,259</td>
<td>189,590</td>
<td>16,593,742</td>
</tr>
<tr>
<td>% Change</td>
<td>+48</td>
<td>+25</td>
<td>---</td>
<td>+110</td>
<td>+90</td>
</tr>
<tr>
<td><strong>Acres Improved</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1860</td>
<td>35,556</td>
<td>*</td>
<td>8,144</td>
<td>27,766</td>
<td>2,468,034</td>
</tr>
<tr>
<td>1880</td>
<td>73,717</td>
<td>69,060</td>
<td>32,416</td>
<td>137,448</td>
<td>10,669,698</td>
</tr>
<tr>
<td>% Change</td>
<td>+107</td>
<td>---</td>
<td>+298</td>
<td>+395</td>
<td>+332</td>
</tr>
</tbody>
</table>

+Includes Portions of Placer County Not in Study Area

*Incomplete or Unreliable Data
sion occurred before 1860. El Dorado County, with big declines in mining markets, increased only 12 percent, while Amador added 36 percent more farms. The northern counties more than doubled their total number of farms.

Central Mines farms were also quite small on the average. They contrasted sharply with those elsewhere in the state. In 1860, more than 60 percent of the region's farms averaged less than 100 acres, as compared to 48 percent of the state's. The average farm size for the region in 1880 was still barely half that of the state. The proportion of the total farms formed by these tiny units was lower for the region than for the state in 1880, but this decrease was offset by a big statewide increase in large farms (over 500 acres) due to the Central Valley grain expansion.

One of the key trends that led to larger farm size was the addition of acreage to existing units. In all four counties, the number of farms of less than 100 acres decreased dramatically. This decrease was due partially to the addition of new land to farms by further government patents or by purchase and consolidation of several small farms into one larger operation. Hundreds of land sales occurred every year and many were for this purpose (Angel 1882; 435). Finally the census figures on farm distribution confirm the patterns derived from Land Office records and shown on Map 3-2. The census lists 1794 farms in the
study area in 1880. Of these, 1264 or 71 percent were located in the following eleven townships:

Placer 2 -- 120  Rough & Ready -- 148
Placer 3 -- 148  Amador 1 -- 91
Placer 9 -- 52  Amador 2 -- 150
White Oak -- 70  Amador 3 -- 213 (165 in the western portion)
Placerville -- 74  Amador 4 -- 77
Grass Valley -- 121

These townships contain most of the areas identified as the six zones of greatest increased land patents. Farmers continued to purchase and patent land in the areas where successful agriculture was already well underway.

Changes and Diversity in Production

Crop and livestock production underwent substantial changes from 1860 to 1880 (Table 3-3). Five categories of farm products were important to the region. Each reflected the changes that occurred within the Central Mines, as well as on the broader front of agriculture in California.

Livestock

Livestock raising was one of the earliest forms of agriculture in the mining country. Cattle had been driven
### TABLE 3-3: CROP AND LIVESTOCK STATISTICS FOR THE CENTRAL MINES COUNTIES, 1859-1880

<table>
<thead>
<tr>
<th></th>
<th>1859-1860</th>
<th>1870</th>
<th>1873</th>
<th>1880</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bushels Grain¹</td>
<td>267,655</td>
<td>280,227</td>
<td></td>
<td>505,407</td>
</tr>
<tr>
<td>Tons Hay</td>
<td>17,814</td>
<td>23,612</td>
<td></td>
<td>42,915</td>
</tr>
<tr>
<td>Bushels Potatoes</td>
<td>35,066</td>
<td>22,347</td>
<td></td>
<td>61,862</td>
</tr>
<tr>
<td>Orchard Trees²</td>
<td>347,558</td>
<td></td>
<td>419,696</td>
<td></td>
</tr>
<tr>
<td>Value Market Garden</td>
<td>$146,992</td>
<td>$86,999</td>
<td></td>
<td>$52,034</td>
</tr>
<tr>
<td>Vines²</td>
<td>316,117</td>
<td></td>
<td>4,247,197</td>
<td></td>
</tr>
<tr>
<td>Value Forest Products</td>
<td>$123,956</td>
<td></td>
<td></td>
<td>$212,168</td>
</tr>
<tr>
<td>Dairy Cattle</td>
<td>13,114</td>
<td>7,991</td>
<td></td>
<td>9,343</td>
</tr>
<tr>
<td>Other Cattle</td>
<td>37,433</td>
<td>11,349</td>
<td></td>
<td>17,548</td>
</tr>
<tr>
<td>Sheep</td>
<td>47,697</td>
<td>68,401</td>
<td></td>
<td>164,604</td>
</tr>
<tr>
<td>Swine</td>
<td>49,309</td>
<td>18,070</td>
<td></td>
<td>19,817</td>
</tr>
<tr>
<td>Value Livestock</td>
<td>$2,322,492</td>
<td>$1,253,066</td>
<td></td>
<td>$1,162,066</td>
</tr>
</tbody>
</table>

¹Includes wheat, barley and corn

²Data from State Agricultural Societies Transactions for 1859 and 1874

All other data from U. S. Census of Agriculture for 1860, 1870, and 1880
from Mexico, Oregon, and as far away as Texas during the early gold rush (Margo 1947). Cattle, sheep, and swine were later raised to supply the meat-dominated miner's diet. Statewide, cattle drew upon this market and a tradition descended from the first missions to become the principal commodity in agricultural production.

Herders kept cattle on tracts in the lower foothills during the 1850s feeding them on pasture and feed grain. Occasionally, they summered at higher elevations. Some individuals maintained large herds, but owned no land. In the midst of general trespass on the public domain by miners and others, apparently they felt no need to do so. Later land laws stopped this procedure in the settled areas.

The number of cattle fell sharply during the drought of 1862 to 1864. In 1870, after half a decade of recovery, the census recorded only 19,340 cattle in the mining counties, a drop of 62 percent. Beef cattle suffered the most, losing 70 percent while dairying fell by 39 percent. Curiously, the dairy industry became firmly established during the 1860s despite this decline. Dairy farms, known as "milk ranches" became important around the larger towns, especially in the southern counties (Brown and Shaw 1944; 113). Both beef and dairy cattle populations recovered slightly by 1880, but the era of pastoral agriculture had ended. Most farmers in the Central Mines
raised fewer than 25 cattle, reflecting both the diversity of production on the typical farm and its smallness of scale.

Frontier farmers had kept swine as a matter of course since the earliest penetration of the continent. The Central Mines area, with its abundance of forested and rough, shrub-covered land, was well suited to the common frontier practice of allowing pigs to forage freely and be captured later for slaughter or sale. A substantial market, especially among Chinese, was established early in the gold rush and persisted for several decades thereafter (Transactions, State Agricultural Society, 1884; 214). Despite this ready market and the necessity of importation of hams and other pork products, the number of swine in the four counties declined by 63 percent between 1860 and 1870. A modest recovery did little to overcome the difference in swine population from 1860 or the deficit in supply. Reasons for the neglect of this steadily marketable commodity are unclear. Evolution of the frontier to a settled agricultural zone curtailed this type of loosely controlled activity on other frontiers and may have occurred here as well. Extensive woodcutting removed the range for these nearly feral animals while plantings of expensive crops made them an unwanted source of potential damage. As early as 1867 reports of barley crops grown for swine-feed indicate this shift toward more controlled but also more limited raising (Ibid.; 1867, 520).
Sheep emerged as a successful alternative in California as cattle and swine declined. They were mainly raised in the San Joaquin Valley from Fresno south, but were also an important factor in the Central Mines. Substantial flocks of sheep were located in Placer County, primarily in the Valley portions of the west of the study area. Herders usually drove them to higher elevation forests and meadows for summer pasture. This procedure angered lumbermen because herdsmen often burned forests to create new pasture. In addition, San Joaquin Valley flocks also crossed the region in a pattern of transhumance that took them through Inyo County, along the eastern flank of the Sierra Nevada as far as Lake Tahoe, and then across the mountains and through the western foothills back again (Menzel 1944; 41).

The statistics of all types of livestock may be too low by as much as 28 percent. Census records did not include many livestock pasturing at higher elevations during the counts. Burcham (1956; 234) reported that a Census Bureau study in 1880 found the number of cattle on farms and range to be 815,044 compared to 644,307 for farms only. The figures for sheep were estimated at 5,727,349 and 4,152,349 respectively. A significant portion of these animals undoubtedly were located at least seasonally in the upper elevations of the Central Mines region.
Grain and Field Crops

Grain crops were never important in the four mining counties, although western portions of Placer County did share some of the Central Valley's wheat boom. Nevertheless, small plots of wheat and barley were common in the study area along its western margin. Production increased due primarily to the rapid expansion of wheat in Placer County and barley in Ione township of Amador County. A larger amount of acreage was devoted to the production of hay for livestock feed. Some 34,221 acres were planted in hay by 1880, divided almost evenly between the four counties. Farmers harvested 42,915 tons that year, an increase of 141 percent over 1860. Although some farms planted several hundred acres in either grains or hay, small holdings and diverse cropping never allowed the Central Mines to enter the extensive field-crop system common to the Central Valley.

Orchard Products

Production of both deciduous and citrus fruits in coastal counties and Southern California led to experimentation in the mountain counties as well, with success ranging from limited to spectacular. Apples, peaches, and pears were most common, and by 1859 farmers had planted scores of acres of orchards in the Coloma Valley, around Shingle Springs and southwestern El Dorado county, and in Placer County from
Newcastle to Auburn. Rich soils, the existence of the "thermal belt," irrigation water from mining ditches, and the advent of rail transport to Eastern markets aided a significant increase in orchards in the 1870s. The number of trees increased 21 percent from 1860 to 1873, and by 1890 nearly 600,000 bearing trees and an indeterminate number of recently planted ones grew in the region. Apples underwent serious competition from coastal valleye orchards during this time, and peaches and pears came to dominate local fruit growing. Also, El Dorado County production was surpassed by Placer County's rich orchards along the Central Pacific from Penryn to Colfax.

Fruit growing in the Central Mines was a small-time pursuit, with none of the grand developments of the Valley fruit farms. Most holdings ranged from a few trees to ten or fifteen acres. Individual growers marketed their own products which often left them at the whim of Eastern markets and a railroad monopoly, and contemporary descriptions of the area were replete with references to the wonderful quality and potential of the region for fruit (Preston 1886; 16-21). Acreage and farms in peaches and pears steadily increased. One of the cornerstones of the region's efforts to escape overdependence on gold mining had been found, but still struggled in its infant stages.
Grapes

More dramatic but less permanent than orcharding was the growing of wine and table grapes. The number of vines planted increased more than 1200 percent from 1860 to 1874 (Table 3-3). As in the case of orchards, many of the holdings were small and distributed among numerous farms throughout the four counties. Vineyards of up to several hundred acres did appear, however, in a few select locations. The main areas of grape growing were western Amador County, where a large immigration of Italians aided its development, around Coloma, and in western Placer County. In 1870, Amador County contained fifteen wineries, placing it third behind Los Angeles and adjacent Calaveras Counties (Leggett 1939; 16).

Observers predicted a bright future for the grape and wine industries of the Central Mines. With characteristic dismay at the magnitude of missed opportunities, one newspaper reported:

Now that the transcontinental railroad is done we contemplate a prosperous future for the wine industry. Since no place on the Pacific slope is as well suited for grapes, or even in the world, not to mention its other advantages, we expect the wine industry to grow to such proportions that it will support a population of twice the present size. The only thing necessary to get it going is for some enterprising capitalist
to set up a house to buy Amador County wine and
ship and sell it back east. If they will simply
pay attention the capitalists will see the advan-
tages of investing in Amador County vineyards
(Bancroft 1880b; Vol. 1, 63).

The grape industry never realized those predictions, however,
due to several factors. Frost and insect damage in the
early 1870s slowed expansion and production. More damaging
was an unexpected lag in demand from the Eastern market.
Until 1882, vintners sent most wine to New York and Boston
by ship (Leggett 1939; 102). Later, the railroad moved
the larger share of wine. By then, however, competitive
sources of grapes and wine, notably the famous Napa and
Sonoma Valleys near San Francisco, had achieved prominence.
Whether the development of these alternate grape regions
was due to the proximity of the port of San Francisco and
this persistence of shipping over rail transport is un-
known, but this competition from coastal sources badly
slowmed foothill production. By the turn of the century,
Central Mines grape growing was in serious decline.

Other Agricultural Products

Several other agricultural commodities bear mention
either for their success or their utter failure. Farmers
grew potatoes throughout the Central Mines on small plots
associated with diversified farming. Landowners also cut wood for fuel and shingles. These products formed a significant portion of the timber production of the region. Half of the farms sampled from the agricultural census manuscripts reported incomes from forest products.

The crop experimentation that California farmers pursued elsewhere with such fond optimism extended into the Central Mines as well. Two products of particular promise were silk and tea. El Dorado County farmers tried planting mulberry trees. Here, as in San Jose and Los Angeles, the grees grew well and silk was produced. However, financial and promotional problems intimidated the public and investors and the project failed time after time through the end of the nineteenth century.

Tea was a commodity that had long excited interest in California. The foothills of the Sierra Nevada were regarded as ideal examples of areas of well-drained, light soils required for tea growing. But, intensive cultivation, weeding, and fertilization required extensive labor. White labor was too expensive and anti-Chinese and later anti-Oriental racism prevented use of Chinese or Japanese labor. Financial problems and prejudice halted these efforts at exotic cropping (Baur 1966; 54-59).

One interesting experiment in El Dorado County involved both of these experimental crops. In 1869, a Dutchman, John Snell, brought 26 Japanese to Coloma with the intention of growing tea and mulberry trees. He
founded the Wakamatsu Tea and Silk Colony. Upon perceiving their intentions, white residents tore up the plants and trees in a series of discriminatory raids. Subsequent plantings also failed because necessary irrigation water was denied by white operated ditch companies. The colony disbanded after four years, and the Japanese pioneers, along with their Dutch sponsor, returned to Japan (Moser 1973: 7). Two of California's most optimistic experiments in agriculture ended due to speculative financial inefficiency, ignorance of the crop requirements, and a racist refusal to learn from or even tolerate those who could train the American growers.

Diversity in Production

A principal characteristic of Central Mines farming was its production diversity. The region was known for fruit and grapes, but also produced grains, hay, cattle, other livestock, and market garden products. This diversity resulted not from intraregional variation in crop distribution, but from a variety of products being grown or raised on each farm. A ten percent sample of the agriculture census for 1880 (Table 3-4) reveals that of seven principal types of crops and livestock, four grew on more than half the farms in the region. Least common were market gardens, found on only 15 percent of the farms.
<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number with less than 80 acres improved</td>
<td>139</td>
<td>72.0</td>
</tr>
<tr>
<td>Number with less than 320 total acres</td>
<td>162</td>
<td>83.9</td>
</tr>
<tr>
<td>Number with cash value less than $5,000</td>
<td>181</td>
<td>93.8</td>
</tr>
<tr>
<td>Number with cash value less than $2,000</td>
<td>130</td>
<td>67.4</td>
</tr>
<tr>
<td>Number with cattle</td>
<td>168</td>
<td>87.0</td>
</tr>
<tr>
<td>Number with swine</td>
<td>134</td>
<td>69.4</td>
</tr>
<tr>
<td>Number with income from orchards</td>
<td>111</td>
<td>57.5</td>
</tr>
<tr>
<td>Number with grape vines</td>
<td>58</td>
<td>30.1</td>
</tr>
<tr>
<td>Number with market garden income</td>
<td>28</td>
<td>14.5</td>
</tr>
<tr>
<td>Number with forest products income</td>
<td>98</td>
<td>50.8</td>
</tr>
<tr>
<td>Number with grain production</td>
<td>50</td>
<td>25.9</td>
</tr>
<tr>
<td>Number with less than three of the above products</td>
<td>55</td>
<td>28.5</td>
</tr>
<tr>
<td>Number with three of the above products</td>
<td>50</td>
<td>25.9</td>
</tr>
<tr>
<td>Number with four of the above products</td>
<td>45</td>
<td>23.3</td>
</tr>
<tr>
<td>Number with five of the above products</td>
<td>28</td>
<td>14.5</td>
</tr>
<tr>
<td>Number with six of the above products</td>
<td>15</td>
<td>7.8</td>
</tr>
<tr>
<td>Total number of farms</td>
<td>193</td>
<td>100.0</td>
</tr>
</tbody>
</table>
On the other hand, nine out of ten farmers owned cattle. Of the 193 sampled units, 72 percent produced at least three of the products, while 22 percent produced five or more. Farms with diversified production were located in every census township, regardless of alternative economic functions, proximity to market, or ethnic background of the farmers.

Prospective farmers ignored the trends of agriculture in the Central Valley and set up tiny operations on a diversified plan. Early miner, Lucas Willey, wrote in his diary in 1859 (283), "I expect to keep a few stock, sow a few acres of grain and cultivate a garden and mine at times when there is water and I have time." However, Central Valley influence was blamed for the lack of success suffered by foothills farming:

We fear that the great want of success in mountain farming is the unwillingness to put in hard, honest work, as to live apart from large settlements, or allow for time to get a farm properly started for diversified farming--the only true system, indeed, anywhere--which is there absolutely essential to success. It is hard to overcome the California mania for large farms, ranches and immense herds of cattle, flocks of sheep, hundreds or thousands of acres of wheat and
vast orchards of trees or breadths of vines. Each must be a specialty, so that the farmer can crowd all his farm work into three or four months of the year—planting or pruning and harvesting time, the balance of the months to be devoted to the enjoyment of the proceeds. There are too many who desire to get possession by lease or location of large tracts of valley land, where they may get rich by two or three successful crops of wheat, and then leave for the city or elsewhere. Such men are not farmers in any proper sense of the word (Bancroft 1880b; Vol. 1, 83).

Two types of farms were distinguished by their relative size, sophistication of cropping, orderliness, and marketing. In the areas of concentrated agriculture (Map 3-2), there were well developed farms with a high percent of improved land and a greater concentration on a few products, notably fruit or grains. Mingled among them, but dominating the more rugged areas, higher elevations and areas remote from transport, were tiny, subsistence farms of miserable quality with few cash crops. A correspondent to the San Francisco Bulletin described the latter in 1878 (Ibid.; 872) with some distaste:

There is so little level ground that grain and alfalfa fields are ridiculously small. Hay is an
important part of the produce, however. Farms are found in these foothills in "little nooks and corners... hemmed in on every side by a howling wilderness." Stove wood cut for railroad forms a part of the mountain rancher's income. Hogs are very popular and are let run wild through the woods living on roots and plentiful acorns. Indeed several large tracts of land are dangerous to walkers due to vicious wild hogs... The life of the average foot-hill farmer in the more retired districts is not unlike that of the people in the mountains of Tennessee and other Southern states. He reads a newspaper a week usually, and almost invariably sends his children to school, but his house is very poor and ill-furnished. His food is plain--butter and milk often absent--beefsteak very rare. His clothes are worn till they will wear no more and he is untidy in both person and estate. Visitors are so few that no provision is made for receiving them in cleanliness or order. The more prosperous, those with larger and more productive farms, with a water right of their own, lead a pleasant life. Their income is much more certain than almost any other class of citizens.
Rise of External Marketing

The completion of new transport routes to the East, the rise of mining in Nevada and elsewhere in the West, and the diminished local demand, caused farmers to consider external markets for their products. However, exportation was neither universally adopted nor problem free, and required new steps in organization and cooperation.

Local historian Lardner reported in 1924 (p. 365) that "during pioneer days all products of farms found profitable markets in local mining camps; but as time wore on, the fluctuations of mining and the exhaustion of placer deposits had direct effect upon agriculture." Later, he reported that "Farming 'marked time' for some years, and agricultural production was curtailed to keep step with the greatly reduced local demand, since there was no appreciable production of commodities demanded by outside markets of State and nation" (Ibid.).

Primary and secondary evidence suggests, however, that this is not only an oversimplification but may be entirely wrong. First, in chapters five and six the fallacy of this huge population drop will be shown. The population did fall significantly during the first few years, but it recovered quickly and in 1880 still boasted a total of nearly 90 percent of its 1860 level. Second, as we have noted, the number of farms increased steadily during this period. Finally, new markets for fruit and grapes opened along the
Coast and in the East.

Placer county benefitted most directly from external demand due to the Central Pacific Railroad. By the early 1880s, hundreds of carloads of fresh and dried fruit were rolling eastward to the Nevada Mines and to big eastern cities. The Placer County Board of Trade outlined its advantages in 1887:

Placer County, as the last county on the railroad going to the east, can pick its fruit in early cool hours, pack at night on train and then in a few hours it's in the mountains being cooled. Thus it has a decided advantage over fruit from the valley or coast which must sit around in the heat and travel further.

The railroad monopoly kept transport prices high, but excellent quality created an Eastern demand willing to absorb the costs. Towns such as Newcastle, Penryn, Auburn, and Clipper Gap became rich orchard centers. By 1876, local farmers discussed cooperative means of negotiating with the railroads. No serious efforts were made, however, until the 1880s when Placer County orchardists were among the leaders in formation of agricultural cooperatives.

El Dorado County benefitted early from the Nevada demand and use of the Placerville Wagon Road. The railroad later usurped this route, but shipments to Sacramento and Washoe continued to aid El Dorado County farmers
as production increased amid the worst declines in mining (Darlington).

Decrease in local demand was not as serious in some areas of the Central Mines as in others. Amador County was reported in 1867 to feel the "beneficient influence of the success of the mines, and new vineyards and orchards are numerous" (Bancroft 1880b; Vol. 1, 205). Nevada County, on the other hand, was actually incapable of supplying itself as reported in 1868:

People charge the area (Nevada County) with dullness and lay the blaim (sic.) on a falling off of yields in the mines. This is not a fact--Nevada County's mines are doing as well as ever and promise better. In fact the great cause we believe is the deficiency of agricultural products and manufactures. The recent storms and floods that interrupted travel for a few weeks were sufficient to exhaust our supply of staple products and cause a scarcity in our markets. We have no supply to meet demand, and therefore all our money must be sent abroad and nearly everything we eat and drink is brought from other localities" (Ibid.; Vol. 2, 821).

Two types of markets, therefore, came to compete for the products of the foothills, depending on the availability of transport. A corridor in Placer County and some portions
of El Dorado and Amador counties were open to external markets by 1880 with the completion of rail links. The more isolated portions of El Dorado, Amador, and Nevada counties depended on traditional local markets. It was certainly no accident that the first group coincided with the zones of greatest increase in farm acreage and production. Establishment of external markets for agriculture was an important step for the region in evolving from its self-preoccupied regional character into an integral part of a wider economic system.

**Agriculture’s Relationship with Mining**

Farming had functioned as a secondary economic activity in the Sierra Nevada foothills since the invasion of non-Indian peoples began. Fur trapping and lumbering were the earliest concerns. These were swept away in the flood of miners after Marshall’s discovery. No field of crops could block mining wherever gold was found. Towns, roads, and local governments developed around mining and a society that pursued it.

In addition to gaining new markets, agriculture made other strides toward independence from mining during the period 1860 to 1880. By doing so, it laid the foundation for the evolution of the region away from dependence on mining as a source of population support. There were two ways in which this was accomplished—legal changes that
established landholding rights, and the use of mining water ditches by farmers.

The Act of 1866 greatly clarified land rights by upholding mining claim laws and permitting the purchase of lands for mining. It also gave farmers the right to obtain land from the General Land Office and farm it without threat of trespass or crop destruction by miners. Ambitious gold seekers were required to negotiate with a farmer for purchase of either his land or his permission to mine it. Land settled prior to the Act of 1866, or claims filed for agricultural development thereafter, could be challenged by miners before final title was granted. However, the burden of proof was on the miners to prove that the land, in forty acre plots, was more valuable for mining than agriculture. The Land Commissioner conducted hearings and awarded title based on this judgement of value (U.S. Land Office 1870). The effect of the law on agriculture in the mining counties was immediately felt, as reported in an 1870 newspaper article:

A recent enactment by Congress whereby titles may be served to land in those counties (mining counties) gives us reason to believe the rapid decline of the past few years will be reversed. These laws are proving beneficial both to mines in giving the sanction of law to rights which have heretofore been founded merely upon custom, and to the agricultural-
ist in "giving full title to land which has previously been held by nothing better than sufferance." The farmer can now "improve his lands by planting trees and vines, building fences, barns, houses, etc., on the surety that he will be protected in his property against all intruders" (Bancroft 1880b; Vol. 1, 78).

Agriculture in the 1860s also began to use mining infrastructure. Most important were the miles of mining ditches. In some cases, separate systems of irrigation canals were constructed or adapted from those originally built for mining. The State Agricultural Society reported more than 10,500 acres under irrigation in 1877 in the counties of Amador, Placer and Nevada, ninety percent of which were in Placer County. Thus, when agriculture began to expand, the mining water system provided a useful framework on which to develop. No other portion of the state had this initial advantage for irrigation.

Summary and Conclusion

Agriculture in the Central Mines matured and expanded. At its inception, it was a subsidiary, dependent industry devoted to small-scale supply of local miners. At the end of twenty years of adaption and progress, trends had been established and characteristics assumed that laid the
foundation for growth, change, and independence. More and more workers and ex-miners turned to farming as a logical alternative to mining in this limited resource zone. Farms increased in number with the passage of laws allowing secure land patents in the 1860s. Decreased local demand was replaced by external markets where transport sufficed. Legal victories, new markets, and viable competition for water promoted independence from mining.

The nature of farming changed at the same time. Livestock declined as demand for fruit and wine supplanted the "beef and beans" diet of miners. Farms increased in size and land speculation diffused from the Central Valley to the foothills. Still, tradition from the early farms and the character of the rugged relief prevented the sort of massive monocultural farms characteristic of the big valley to the west. At the end of the 1870s, Central Mines farming was still diverse though concentration on fruit had begun, still small though average farm size had increased nearly 14 percent, still locally marketed though the railroad had changed some sections, and still regarded as poor in quality and appearance though Placer and Amador Counties boasted rich orchards and vineyards. The era of total dominance by mining was ending. Agriculture made the first significant steps to establish an independent, viable alternative. It still had a long way to go but, according to
local farmers and businessmen, all that was needed was
"an increased population of a vigorous character, that our
lands now idle may be made to yield more largely of the
fruits of the earth."
CHAPTER 4
CHANGES IN OTHER LAND USE FUNCTIONS, 1860-1880

Gold mining and agriculture were the dominant industries in the Central Mines area through the period 1860 to 1880. As mining changed spatially and technologically and agriculture expanded, other economic functions responded according to their relationship to local stimuli and external pressures. The two most important were the lumber and transport industries. Both began with the gold rush and increased in importance as the population grew. But, as mining decline set in, their courses parted because lumbering depended heavily on a local market and transport evolved into an industry respondent to external economic and political stimuli. In this chapter, the salient geographical features of these two economic factors will be examined, followed by a few remarks on other tertiary and secondary activities. The evolution of these industries is particularly interesting because both were indicators of systematic change due to the difficulties that befell mining.

Lumbering and Woodcutting

The period from 1860 to 1880 was an important one for the nationwide lumber industry. As production costs soared and commodity prices remained fairly constant, many firms in the long established Great Lakes area turned to vertical
integration and expansion of operations to keep profits ahead of costs. Some firms began operations in the Pacific states, increasing their total holdings and influence (Blackford 1977; 61).

Against the backdrop of these large-scale maneuverings and corporate consolidations, the experience in the mining counties was a distinct contrast. Timber cutting, like all other rush-era economic activities, initially depended almost entirely on mining and miners for a market. It was small in scale, locally operated, and unsophisticated in organization. In the two decades after the Comstock discovery little changed. The principal trends were declining production, division of production among corporate professionals and a polyglot of amateurs, and a continuation of local, small-scale marketing.

Five characteristics describe the lumber and wood cutting industry during this 20 year period:

1. Production declined significantly, according to reported figures. This was especially true in the professional segment of the industry, the commercial mill-cut timber;

2. Lumbering operated on a small scale, made up of low-capacity company mills, independent shake-makers, and increasing numbers of farmers clearing their woodlands;
3. The vast majority of the timber products were marketed locally, primarily to the quartz mines and ditch companies;

4. As was common elsewhere in the nineteenth century, the business of woodcutting was carried on in an egregiously wasteful manner, resulting in the destruction of enormous tracts of forest for minimal purpose and gain;

5. The lumber industry came to compete with other land use functions, particularly agriculture, for land, water, and water distribution systems.

Each point shows the intimate relationship between the lumber and mining industries in this region. As mining itself underwent rise and decline, its helpful sister primary industry was deeply affected.

The Forest Cover Prior to the Gold Rush

The timber resource available to Central Mines lumberers was a diverse and rich one. From the beginning of the gold rush it attracted attention on its own merit. Three distinct associations were available to Central Mines lumbermen. They were the familiar oak parkland of the lower elevations at the edges of the Central Valley, the mixed coniferous forest of the middle elevations, and the higher elevation alpine coniferous forest. The middle elevation forest was the valuable and useful segment of the
timber resources, but all three communities came under the axe for one reason or another.

The lower foothills of the Sierra Nevada, lying between the 500 and 2000-foot elevations were characterized by a brushy, open forest or, at the lowest elevations, large tracts of grassland with oaks occurring as individuals or in small groves. This association formed a transition between the forests of the higher Sierra Nevada and the largely treeless Central Valley (Map 4-1). Arboreal coverage was generally less than 30 percent and often less than 10 percent. Dominant trees in the region were California Black Oak (Quercus kelloggi), Canyon Live Oak (Q. crysolepsis), Interior Live Oak (Q. wislinzenii), Blue Oak (Q. douglasii), and Digger Pine (Pinus sabiniana). Many of the oaks attained considerable height and girth. They were considered inadequate for use in construction and mine timbering but were fine sources of fuel, often as charcoal. For this reason, the oak woodland came under immediate and intense pressure.

California Oat Grass (Avena fatua), a Mediterranean import of remarkable colonizing ability, dominated the understory of the oak parkland. At upper foothill elevations and on north facing slopes, the oaks and Digger Pine often occurred in association with elements of the chaparral community most notably Manzanita (Arctostaphylos spp.) and Madrone (Arbutus menziesii). The latter community is
notoriously fire prone and contributed to the constant danger of fire that plagued the mines and towns of this region.

The middle elevation association of the Sierra Nevada's western slope ranged from 1700 to 7000 feet, increasing in maximum and minimum elevation as one proceeded south along the mountain chain. This forest was generally broad, 30 to 50 miles in width, and consisted of stands that though open and parklike produced abundant merchantable timber (Transactions, State Agricultural Society 1888; 26-26). The dominant species, in decreasing order of importance, were Yellow or Ponderosa Pine (P. ponderosa), Sugar Pine (P. lambertiana), Jeffrey Pine (P. ponderosa var. jeffreyi), White Fir (Abies concolor), Incense cedar (Libocedrus decurrens), and California Black Oak. Wagoner (1885-86; 42) estimated the coverage of some of these species in Amador County and the Southern Mines counties adjacent to it as follows:

<table>
<thead>
<tr>
<th>Tree</th>
<th>Lowest Height</th>
<th>Highest Height</th>
<th>Ave. Width of Zone</th>
<th>Percent Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinus sabiniana</td>
<td>430</td>
<td>2900</td>
<td>25</td>
<td>9</td>
</tr>
<tr>
<td>Pinus ponderosa</td>
<td>1700</td>
<td>8280</td>
<td>50</td>
<td>31</td>
</tr>
<tr>
<td>Pinus lambertiana</td>
<td>2100</td>
<td>6277</td>
<td>38</td>
<td>5</td>
</tr>
<tr>
<td>Libocedrus decurrens</td>
<td>2000</td>
<td>7830</td>
<td>48</td>
<td>15</td>
</tr>
<tr>
<td>Quercus kelloggii</td>
<td>500</td>
<td>800</td>
<td>50</td>
<td>4</td>
</tr>
</tbody>
</table>

The pines and firs in this zone all attained size enough to furnish plenty of high quality lumber. This association formed the great timber reserve for California. Wood for
all purposes could be obtained here. In the Biennial Report of the State Forester for 1910 (p. 26), it is estimated that the forest supplied from 2000 to 100,000 board feet per acre with an average yield of 25,000, well above that for North American forests. The forest understory included many fire-climax species; forest fires posed an aggravating problem, particularly in the later years of the century.

The final association along the western flank of the Sierra Nevada occurred in the upper elevations of the mountain chain, along the eastern margins of the study area. It was dominated by Lodgepole Pine (P. contorta, var. Murrayana) and Whitebark Pine (P. albicaulus). Red Fir (Abies magnifica) and Jeffrey Pine also furnished usable wood. This forest was open, often nearly inaccessible, and extended from 6000 to 9000 feet in elevation. This association was not significant as a supplier of timber, but contributed to the watershed management of the region.

Production Decline

Decline in production and spatial variation were the most significant changes in the lumber industry from 1860 to 1880. During that period, the number of operating sawmills plummeted, perhaps by as much as 50 percent (Table 4-1).* The number of board feet cut, while also declining, did not

*A discrepancy of nearly 50 percent between the census figures and those of the state agricultural society may be explained by the fact that the smaller census figures list only mills that produced 500 dollars worth of material while the agricultural society statistics include all mills.
TABLE 4-1: LUMBER STATISTICS FOR THE CENTRAL MINES, 1859-1880

<table>
<thead>
<tr>
<th>County</th>
<th>Years</th>
<th>Number of Sawmills</th>
<th>Board Feet Cut</th>
<th>Value of Mill Production</th>
<th>Value of Farm Production</th>
<th>Shakes Made</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1859-1860</td>
<td>15</td>
<td>12</td>
<td>11,400,000</td>
<td>163,400</td>
<td></td>
</tr>
<tr>
<td>Amador</td>
<td>1869-1870</td>
<td>7</td>
<td>5</td>
<td>5,630,000</td>
<td>37,240</td>
<td>2,615</td>
</tr>
<tr>
<td></td>
<td>1877-1880</td>
<td>4</td>
<td>4</td>
<td>4,000,000</td>
<td>50,000</td>
<td>55,621</td>
</tr>
<tr>
<td>El Dorado</td>
<td>1859-1860</td>
<td>40</td>
<td>13</td>
<td>5,200,000</td>
<td>241,175</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1869-1870</td>
<td>25</td>
<td>12</td>
<td>8,940,000</td>
<td>108,280</td>
<td>30,907</td>
</tr>
<tr>
<td></td>
<td>1877-1880</td>
<td>15</td>
<td>10</td>
<td>10,090,000</td>
<td>81,796</td>
<td>38,604</td>
</tr>
<tr>
<td>Nevada</td>
<td>1859-1860</td>
<td>44</td>
<td>15</td>
<td>40,000,000</td>
<td>413,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1869-1870</td>
<td>33</td>
<td>10</td>
<td>35,000,000</td>
<td>455,300</td>
<td>63,635</td>
</tr>
<tr>
<td></td>
<td>1877-1880</td>
<td>25</td>
<td>7</td>
<td>30,000,000</td>
<td>119,792</td>
<td>70,982</td>
</tr>
<tr>
<td>Placer</td>
<td>1859-1860</td>
<td>21</td>
<td>19</td>
<td>11,800,000</td>
<td>231,230</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1869-1870</td>
<td>15</td>
<td>14</td>
<td>17,000,000</td>
<td>186,250</td>
<td>26,795</td>
</tr>
<tr>
<td></td>
<td>1877-1880</td>
<td>4</td>
<td>7</td>
<td>1,650,000</td>
<td>203,000</td>
<td>46,961</td>
</tr>
<tr>
<td>Study</td>
<td>1859-1860</td>
<td>120</td>
<td>59</td>
<td>68,400,000</td>
<td>1,408,805</td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td>1869-1870</td>
<td>80</td>
<td>41</td>
<td>66,570,000</td>
<td>787,070</td>
<td>123,952</td>
</tr>
<tr>
<td></td>
<td>1877-1880</td>
<td>48</td>
<td>28</td>
<td>45,740,000</td>
<td>454,888</td>
<td>212,168</td>
</tr>
</tbody>
</table>

1 - Underlined Figures From U. S. Census, Others From State Agricultural Society

2 - Three Counties Only
follow the trend to such a pronounced degree. In El Dorado and Placer counties, production of cut wood actually increased while the number of mills decreased. The discrepancy is explained by the fact that farm-produced forest products increased from 1870 to 1880 and represent a sizeable input of fuel wood and unsawed timber for various purposes. Hence, mills were freed or perhaps forced to concentrate on sawed lumber, increasing production in the remaining mills while slowing decline in value of production. Both statistical data and contemporary descriptions suggest that a large increase in cut lumber was feasible within the existing system of mills (Table 4-2). Placer County lumber mills produced at only 36 percent of capacity in 1861 (Steele 1861).

Production of shakes and shingles declined drastically (Table 4-1). Any statistics on this activity, however, were haphazard guesses because it was thoroughly uncontrolled and individual in nature. The best explanation for the huge decline is suggested, at least partially, by the increase in farms, most of which produced some forest products including shakes and shingles.

The lumber industry concentrated spatially on lower stands of the mixed coniferous forest at elevations ranging from 3000 to 4500 feet. Two zones of activity were along the right of way for the Central Pacific Railroad in Placer and Nevada counties and along the Placerville Wagon Road, the route to Washoe and the Comstock mines.
<table>
<thead>
<tr>
<th>Mill</th>
<th>Capacity (Board Feet)</th>
<th>1860 Production</th>
<th>Percent Of Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Hill Mill</td>
<td>2,500,000</td>
<td>200,000</td>
<td>8.0</td>
</tr>
<tr>
<td>Parkinson &amp; McCloy's Mill</td>
<td>1,500,000</td>
<td>250,000</td>
<td>16.7</td>
</tr>
<tr>
<td>Mt. Pleasant Mill</td>
<td>1,200,000</td>
<td>600,000</td>
<td>50.0</td>
</tr>
<tr>
<td>Dutch Flat Steam Mill</td>
<td>1,000,000</td>
<td>750,000</td>
<td>75.0</td>
</tr>
<tr>
<td>E. J. Brickell's Mill</td>
<td>1,500,000</td>
<td>500,000</td>
<td>33.3</td>
</tr>
<tr>
<td>Mountain Mill</td>
<td>1,500,000</td>
<td>500,000</td>
<td>33.3</td>
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<tr>
<td>New England Mill</td>
<td>1,200,000</td>
<td>700,000</td>
<td>58.3</td>
</tr>
<tr>
<td>Empire Mill</td>
<td>1,000,000</td>
<td>500,000</td>
<td>50.0</td>
</tr>
<tr>
<td>C. S. Preble's Mill</td>
<td>400,000</td>
<td>200,000</td>
<td>50.0</td>
</tr>
</tbody>
</table>

*Source: Steele, 1861
Availability of lumber transport limited the distribution of mills, and these major transport links provided ease of movement and access to market. In addition, the railroad itself required immense amounts of wood for ties, buildings, and fuel.

Forest industries, therefore, declined by every available measure. The number of sawmills decreased by half while board feet of cut lumber dropped 33 percent. The value of production, despite the increase of forest products from farms, fell more than 50 percent. These figures, although incomplete, show that the decline in population and economic activity meant hard times for many a lumbering concern.

**Diversity and Small Scale of Producers**

A wide variety of companies and individuals produced forest products in the mining counties. As the mills became fewer and individual sawmill production greater, this characteristic intensified. Shake makers and charcoal woodcutters had always characterized the mining region, operating individually or in small partnerships and availing themselves of the ready resources on federal lands. As more land near the mines and settlements came into the hands of farmers, a significant portion of this amateur lumbering shifted to the clearing of private wooded farm-land. The percent of total production value accounted for by farm clearing in 1870 was 15.7. This had increased by
1880 to 46.6 percent.

One statistic not available is the amount of wood and lumber taken by the employees of mines and ditch companies, and railroads. At Truckee in the high Sierra east of the mining country, the Central Pacific was reported to be employing 350 Chinese laborers just to cut wood and make charcoal (May 1956; 2). Along the path of the railroad these laborers cut a 20 mile wide swath through the forest (Map 4-1). The employees of these companies, the private landholders, and the small but growing commercial mills divided timber production and assaulted the resource in an undisciplined fashion.

Local Marketing

Timber and lumber from the Sierra Nevada counties was used for many purposes. Wagons, houses, buildings, bridges, fences, boxes for produce, windmills, barns, tools, and furniture required wood wherever the American pioneer settled. In the mining region, quartz and hydraulic mines added to the demand. The Report of the State Mineralogist (1882; 202) listed some of the uses in a quartz mine for wood including "timbers and lagging for tunnels and shafts, derrick-masts, water-wheels, flumes, pressure-boxes, bridges, houses and sheds, mills, hoisting-works, tramway tracks and cars, paving blocks for flumes, penstocks, pick and tool handles, water and pulp tanks, salt pans, furniture
and minor machinery, boats, and fuel, including charcoal."

This combined market of the mines and the oft-burned, wooden towns placed a heavy demand on the producers of wood products. The scale of demand by the mines can be gauged from the report of the Amador Canal and Mining Company (Stretch 1879; 18-19) on its subsidiary, the Amador Lumber Company. In 1877, the company produced:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,000,000</td>
<td>board feet of lumber worth</td>
<td>$60,000</td>
</tr>
<tr>
<td>50,000</td>
<td>lagging (poles cut for mine shaft support) worth</td>
<td>$4,500</td>
</tr>
<tr>
<td>10,000</td>
<td>mining timber worth</td>
<td>$30,000</td>
</tr>
<tr>
<td>2,000</td>
<td>cords of firewood worth</td>
<td>$11,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$106,000</td>
</tr>
</tbody>
</table>

Thirty-three percent of the value of production is accounted for by materials used solely for mine shaft construction. Mines required an indeterminate amount of lumber and firewood to fill many other needs. Ditch companies demanded thousands of cut planks, timbers, and wood blocks for their many miles of flumes, which required virtually total replacement every six to ten months. An estimate of consumption by local mines equalling two-thirds of the total Amador Lumber Company production does not seem unreasonable.

Further evidence can be constructed from the records of the Plymouth Consolidated Gold Mine for the year 1886. A contemporary historian wrote that "the Plymouth cluster
of mines have used up nearly all the available lumber along the line of the ditch and now have to rely on the supplies farther up in the mountains" (Mason 1881: 235). In 1866, the company produced gold valued at 954,822.50 dollars while their expenses included 29,700 dollars in wedge blocks, wood, and timber. If anything, the ratio of gold production to timber costs for this highly successful mine exceeded that of the county average. Yet, if we assume an equal ratio throughout the county (Amador), the mines, in total producing 2,141,591 dollars in gold, would have required 66,737 dollars worth of timber and wood. The nearest available official figures for county production, 1880 and 1890 show average annual value of approximately 100,000 dollars. Thus, it can be hypothesized that the mines used a full two-thirds of the county production of forest products.

There were exceptional cases of external distribution. The Towle Brothers mill near the Central Pacific tracks operated the retail yards in Placer County, but also one in distant Tucson, Arizona. In addition, a limited amount of timber moved along the Placerville Wagon Road to the Comstock. Nevertheless, the above data on lumber consumption by mines, plus the inability of the non-commercial producers to engage in extensive distribution, and contemporary testament to the heavy local demand, provide support for the conclusion that the vast majority of lumber products never left the mining counties. Reporting on Amador County, local historical Mason (1881; 235) remarked, "The sawed
lumber is only a small portion of the amount annually used (in the county). Hundreds of teams are hauling lagging and timbers for the underground works which daily swallow up loads of each. The introduction of water as a motive power for driving the machinery saves a consumption of wood amounting to thousands of cords a year; but no substitute can be found for the underground timbers."

Destructive and Wasteful Methods

Estimates of the timber resources in the Central Mines area were generous and optimistic, as befitted the American spirit and perception of the land. Most observers assumed that it would take centuries to use the vast forests of the Sierra Nevada (Reed 1869; 28-30). This view was particularly common among locals who were busily trying to convince prospective immigrants that the foothills offered the finest opportunities for health and profit in the country, if not the world. Even where forests had been cut over, it was assumed that second growth pines would provide easily accessible material for fuel and limited construction.

Even the most optimistic of the locals had to admit eventually that an enormous tract of forest in the lower elevations had been stripped of usable lumber trees. Careful observation revealed that by 1886 the line of trees "fit for sawing" ranged from 3800 to 4000 feet in Amador County. The pre-gold rush line had stood at 1700 to 2700
feet (Wagoner 1886; 42). This translated to a horizontal shift of up to 35 miles east of the Mother Lode mining belt. Other Central Mines counties reported similar figures. Even with the enormous demands of the mining industry, this represented an unaccountable assault on the local forest reserve.

The answer comes in the method of wood cutting and foresting undertaken in these areas. With characteristic frontier optimism, ambition, energy, and lackadaisical appreciation for resource stability, the miners, wood cutters, and builders moved against the forest reserve in a hasty and irresponsible manner. They often cut trees and used a small part of the wood, leaving the rest to rot. Wood for fuel was extensively used where later, because of the cost of transporting wood from the remnant reserves far upland, water power was adopted successfully.

Chief among the wasteful and destructive culprits were the shake-splitters. These independent entrepreneurs selected the best trees, felled them, and then used small portions, sometimes less than ten percent, to split off the three or four foot, rough, roofing shingles. Amador County historian, Jesse D. Mason (1881; 235), described the shake-splitters in this fashion:

If any tree could make a fitting residence for a god, the sugar pine with its straight shaft, as beautiful as a Grecian column, a hundred feet high,
without limb or knot to mar its magnificent proportions, would be the one. Yet a shake-splitter will ruthlessly cut one of these monarchs down, use a few feet to make shakes, or, if it does not quite suit him, abandon it, and move on to another, which he will serve in like manner. Far in advance of the regular lumberman may be seen the shaker-splitter selecting the best trees, which he will destroy to get means to purchase a bottle of whisky and sack of flour, or get enough to indulge in a day or two of debauchery in the nearest town.

These individuals destroyed countless trees. The value in lost lumber far exceeded that obtained from the few shakes for which they were felled.

This wasteful cutting forced lumber mills and companies to move farther and farther inland away from the principal markets. Transport of wood by flume or wagon was expensive. The cost of timber products rose, placing a greater burden on the customers. Inflation of lumber prices made ever more difficult the precarious financial existence of the mines.

Some observers predicted dire consequences of the wasteful manner this wonderful resource was being attacked. A correspondent to the State Agricultural Society wrote in 1869:
It is now but about twenty years since the consumption of timber and lumber commenced in California, and yet we have the opinion of the good judges, the best lumber dealers in the State, that at least one-third of all our accessible timber of value is already consumed and destroyed! If we were to continue the consumption and destruction at the same rate in the future as in the past, it would require only forty years, therefore, to exhaust our entire present supply . . .

One of the worst features of the settlement of new countries by Americans is the useless and criminal destruction of timber. In our State this reckless and improvident habit has been indulged in to an unprecedented extent (Reed 1869; 29).

Relationship with Other Land Use Industries

Despite the local consumption of lumber products, the relationship between lumber companies and the mines and farms of the region was more than that of grateful supplier and greedy consumer. Two other features are worthy of comment. (1) The corporate branch of the lumber industry found it difficult to use the infrastructure provided by the mining economy and, (2) lumbering came into conflict with the burgeoning agricultural sector over perceived wrongs committed by each side.
The costs of wagon transport became considerable as the distance from mill to market increased. The obvious solution for many was to use the water transport systems—the rivers and canals. Water transport would increase revenues to canal and flume companies while moving lumber cheaply. Lumber companies tried this with some success in the mining region, but problems arose that eventually necessitated the abandonment of mining flume infrastructure and the construction of an alternate system. The mining flumes were generally U-shaped or flat bottomed troughs that brought the maximum amount of water. Unfortunately, all too often one log would somehow become jammed in the flume causing others to pile up behind it and creating a dam. Water flowing through the flume then overflowed and washed out the supports for the structure, bringing the entire contraption down.

To solve the problem, it was necessary to build flumes in which the trough was V-shaped to keep the logs floating on course. However, this meant expensive duplication because the mines already used hundreds of miles of flumes of the wrong type (Mountain Democrat 1928; 4).

Transport of logs by river brought the lumber industry into unexpected conflict with farmers. An example of what occasionally happened occurred on the American River in 1889. An attempt to send logs by the river was rewarded with an overflow that dumped numerous logs onto private
farmland. Landowners appropriated the logs. In a subsequent lawsuit, the court forced the farmers to return the logs but fined the lumber company for trespassing (Ibid.).

The seasonal movement of sheep through the prime forest lands exacerbated the conflict between farmers and lumbermen. Sheepmen occasionally burned land behind them to encourage pastures for the next season. Forest fires developed, consumed acres of valuable timber, and brought the wrath of the lumber industry. The problem grew serious as the nineteenth century drew to a close, and only diminished when creation of national forests brought stricter control (Brown and Shaw 1944: 156-157). Thus, like mining, the commercial lumber industry required a distinct and expensive infrastructure. Also like mining in its sometimes hasty and wasteful search for production and profit, it came into conflict with others using the same land and water for other purposes.

The lumber industry began as the scattered gathering of wood by industrious miners, and continued to serve the mineral industry. As mining and the population declined, the number of mills and timber production also fell. The scale remained small and the producers included numerous part time individuals. This smallness of scale befitted an industry with a local market and close dependence on another economic function.
The wastefulness and haphazard techniques also mirrored some of the problems and characteristics of mining. Agri­culture, which called for more careful husbandry of resources and permanence of operation, ran afoul of lumbering as it often did of mining. The lumber industry was born of mining, depended upon its demand, used its infrastructure where possible, and when hard times came, declined with it.

The Transport Industry

While the lumber industry maintained its small scale and dependence on local markets and local events, the transport industry shifted to a larger scale. Local freighting and passenger services continued, of course, to respond to local population and economic demands. However, the discovery of silver and gold to the east and the realization of a political and economic dream led to the creation of two transport corridors that deeply affected the subsequent geography of the region. As products and people moved along these corridors through the region, the mining country, the goal of so many optimistic fortune hunters in the past, became a small and altitudinally un­attractive part of the state.

Two important types of cargo and passenger movement systems existed. Wagon freighting, the earliest, employed hundreds as individuals or in small partnerships and
companies. The railroad, on the other hand, was a huge multi-state corporation that dominated all of California in later years. The development and distribution of each, including settlement of the emotional issue of route choice for the transcontinental railroad, vitally affected the evolution of the Central Mines man-land system.

The Wagon Trade

An established, but declining, freight system greeted the news of the Comstock strike with anxious enthusiasm. Although the local economy was depressed, this new mining region provided demand and allowed high prices. Money was to be made by the entrepreneur with ambition, a sturdy wagon, and a healthy team of horses, mules, or oxen.

Several routes through the Central Mines region were available, including Henness Pass in the north, the Mokelumne River route along the southern boundary of Amador County, and the Donner Pass route through Auburn and Dutch Flat. By far the most important route, however, was the Placerville Wagon Road. This winding and difficult trail led along the South Fork of the American River, through Placerville, and crossed the mountains skirting the south end of Lake Tahoe before descending into Nevada. At the western end of the Wagon Road, a railroad connected the region with the Central Valley and, indirectly, with the ports of San Francisco Bay.
The trade over the Placerville Wagon Road from 1860 to 1866 was enormous. In 1864 during a three month period, the following passed a toll bridge east of Placerville--6667 footmen, 833 horsemen, 3164 stage passengers, 5000 pack animals, 4649 head of stock cattle, and 2564 wagon teams (Mountain Democrat 1928; 9). During the years 1864 and 1865, 320 tons of freight rumbled through Placerville daily. The aggregate of freight charges for 1863 has been estimated at 12,000,000 dollars (Ibid.; 9).

Along the Wagon Road activity was brisk and business booming. Toll bridges, privately constructed and maintained, brought healthy incomes to the owners and the county. Wayside stations and inns were busy. One, called Sportsman's Hall, east of Placerville, could stable 5000 horses at once. The town of Shingle Springs boasted a local teamster union membership of 480. Times were good again, and El Dorado County could face the future with reason for optimism and plans for expansion (Ibid.; 9).

One critical factor ignored amid all this activity, however, was that neither the supply nor the market was in the hands of locals. As such, the wagon trade was entirely susceptible to outside decisions and events. Observant contemporaries readily pointed out some results of this unfortunate lack of control. One correspondent to an early California newspaper wrote in April, 1863, "the trade and travel to Washoe does not create the business
that might be expected; people and teams now finding it just as convenient to stop overnight a few miles short of or beyond the town (Placerville) and generally requiring no outfit" (Bancroft 1880b; Vol. 1, 198). Local merchants and capitalists could never maximize profits, nor could they prevent alterations in the system detrimental to their economic livelihoods.

The problem of diminished local services had little impact in El Dorado County compared to the completion of the Central Pacific Railroad through Dutch Flat. Accurate estimates of the business losses to the Placerville wagon route are impossible, but the 3000 teams and 600,000 dollars toll bridge revenue reported in 1872 were pale shadows of the amounts a decade earlier (Mountain Democrat 1928; 10). The effect on El Dorado County towns was devastating and many centers were reported as looking "quite glum and deserted." In 1886, the county had to assume the ownership and upkeep of the financially failing bridges and roads. The traffic simply did not support private maintenance of these costly improvements. An era of prosperity and excitement of a different and even more ephemeral sort came to an end particularly in El Dorado County as the lucrative business of freighting and transport shifted its course to the Dutch Flat route in Placer and Nevada counties.
The Railroads

Like the wagon trade, the railroads began as a venture designed to supply the Central Mines with the products their busy and generally well-fixed populace demanded. The Sacramento Valley Railroad pushed through to Folsom on the western edge of Placer and El Dorado counties in 1856. Nine years later, the renamed Sacramento and Placerville Railroad extended to Shingle Springs to link up with the bustling Placerville Wagon Road. One of the earliest railroads in California, the Sacramento and Placerville was planned and incorporated when the Sierra Nevada mining country was a place to get to, rather than a place to get through.

The railroad was still unknown within the Central Mines though, when a bitter struggle for the biggest prize of all took place. Agitation for a transcontinental railroad had been voiced almost from the day Americans began pouring into the far western territory. The fruition of this agitation is generally credited to the dreams and persuasive ability of one man—Theodore Judah. His consummate skill as a railroad engineer, untiring field work in search of a route, and indefatigable lobbying efforts in Washington, D. C. were largely responsible for the successful incorporation of a Pacific railroad and its receiving the green light from Congress in the midst of the Civil War.
Five routes offered potential for the transcontinental railroad. Two, north of the Central Mines, passed over Beckwourth and Henness passes. They were considered too likely to be snowbound. One route far to the south along the Mokelumne River was never seriously considered at least partly due to its difficult grade. This left two central routes that had already become bitter rivals in the wagon trade. One closely paralleled the Placerville Wagon Road using Georgetown Ridge and would extend the Sacramento and Placerville's tracks through to Nevada via Placerville and the southern tip of Lake Tahoe. The second was the Dutch Flat route passing through to Donner Pass. Around these two, and the jealous ambitions of several Central Valley towns, a struggle waged for more than three years (McAfee 1973; 49-53).

Judah had surveyed several of the routes, cursorily his enemies claimed, and with the considerable aid of a knowledgeable Dutch Flat merchant, pronounced the Donner Pass route to be the best. Angry that their chief engineer had publicly favored this alternate route, his employers, the Sacramento Valley Railroad, dismissed Judah. He, undiscouraged, journeyed to San Francisco to elicit support from the big city's capitalists. He met, however, with curious disinterest. Still unaffected, he returned to Sacramento where enthusiasm for his plans ran quite high. The Central Pacific Railroad Company was formerly incor-
porated in 1861 with stockholders including the soon to be elected governor, Leland Stanford.

A newspaper battle began at this juncture with most of the mountain and valley towns lined up in opposition to Sacramento and Placer County. Marysville and Stockton were particularly vehement and began to sway the opinion of the powerful San Francisco population with pamphlets sporting such titles as "The Dutch Flat Swindle." Sacramento and the Central Pacific had the initiative, however, and the combination of Judah's well-known and respected presence lobbying in Congress and the election of Stanford as a Republican governor during Lincoln's tenure as President, gave the decision to the aggressive company in summer 1862. Reaction from the competitors in the mountains and the Central Valley was more violent and angry than ever but the decision stuck and no amount of venomous outcry could change it. The big towns of Marysville and Stockton could do nothing, much less the fading little gold towns in the Sierra Nevada (Ibid.; 50-65).

Work began immediately and brought electrifying results in the economic fortunes of the people and towns along the proposed route. A large labor force, mainly Chinese, was required for the arduous project. Estimates of up to 10,000 workers are common. Just supplying the work force with food and other necessities was difficult. Added to this difficulty was the insatiable demand for construction materials,
especially timber. New towns, such as Colfax, appeared to house and supply the workers and continued as bustling business and communications centers after the rails pushed eastward. The railroad was through to Nevada by 1868 and ushered in a new era of prosperity for the fortunate ones near its course. The supreme form of transport was now available to many Placer County farmers and businessmen and their market expanded to a nation.

The effect on the surrounding areas was depressing. The Placerville Wagon Road, as noted, suffered a serious decline in business. By comparison to the immediate Central Pacific hinterland, the other foothills areas offered little opportunity. Nevada County seized the chance to hook its rich quartz mines up to the big railroad by completing a narrow gauge connection from Nevada City to Colfax in 1876. Hence, it indirectly benefitted from the large scale transport system. To the south, a drama of smaller scale took place. In 1876, the Amador Branch Railroad was completed to Ione from Stockton, spelling doom for the wagon road through Latrobe to the big mines of Amador County.

External decisions had located a transport link in the region, forever altering its geography and history. The surrounding counties' fortunes rose and fell in the decades to come. But, Placer County, regardless of the fate of the mines or lumbering, clung tenaciously to the Central Pacific
lifeline and progressed. The agricultural and service population, grateful for the decisions of a state and nation, gravitated to the artery and set this area apart for the remainder of the long period of adjustment.

Other Economic Functions

Other economic activities also influenced the region. All responded to fluctuations in the level and distribution of population. Three characteristics of these activities were of particular note. First, the political functions and employment connected with holding the county seat position were of value to four towns--Nevada City, Auburn, Placerville, and Jackson. In the case of Auburn, it may have been critical to its survival during the bleak years before the railroad. Suffering through three severe fires in nine years and a catastrophic emigration of miners, the town survived almost solely on its role as a political center.

Secondary functions in the mining country were few, restricted to limited fruit canning and drying and a couple of furniture manufacturies. A full compliment of tertiary functions was available, and reflected the population levels and demographic characteristics of the foothill areas. One tertiary exception was the nascent recreation industry. Although the major California montane attractions were to the immediate south, Calaveras Big Trees,
Mammouth Caves, Yo-Semite, the Central Mines counties vigorously lauded their terrain and scenery in hopes of attracting capital attached to tourists. Lake Tahoe, to the east of the study area, brought many visitors over both the Central Pacific Railroad and the Placerville Wagon Road. Less luminous attractions were remarked to possess amazing powers of restoration and health. Mason (1881; 236), the Amador County historian, reports the following startling feature of the nearby mountains.

A delicate feeble woman, who had to be lifted into a carriage at the beginning of the journey, has been known to improve so rapidly in a few weeks as to get up in the morning and, from the very exuberance of feeling give half a dozen Indian yells that could be heard a mile, or catch up a pair of oars and row a half-mile out into the lake, singing and shouting in a way that would bring the police down on her or cause an examination for lunacy if done in a city.

The recreation industry, however, was small. Mason continued by reporting the paucity of hotels and restaurants in the county and the ease with which their capacity could be overtaxed. The time for recreation was still to come.

In summary, as mining declined and altered and the population diminished and shifted spatially, various
economic activities adjusted according to their requirements and abilities. Lumbering, marked by waste and inefficiency, remained a small-scale, local-market industry and followed the fate of mining. So too did most tertiary functions, depending as they did on population levels. The exception came in transport as a locally responsive industry was jolted into the economic and political arenas of the larger American West. Nowhere was the decline of this area shown so graphically as by the situation of the people of this region, once the goal of tens of thousands, breathlessly awaiting distant decisions on where a large scale, external transport system might deign to pass through. The mines went on, and agriculture grew, but the Sierran counties had become a fringe and a barrier, no longer a dream and a goal.
CHAPTER 5

EMIGRATION AND POPULATION CHANGE, 1860 TO 1880

Difficult years began for the Central Mines region in 1859. Declining placer resources, alluring competition from strikes elsewhere, and a series of climatic extremes badly damaged mining. Agriculture and transport industries provided alternate opportunities, but for a boom-time monofunctional system, the transition was slow and difficult. Pessimism and depression swept over the Central Mines population as the economic future clouded. The result, according to all sources, was emigration. Estimates of the size of this emigration vary, ranging from one-third (Todd 1967; 63) to one-half (Paul 1947; 242) in the more severely affected areas. The magnitude and effects of emigration in the Central Mines will be assessed in this chapter.

We have seen that various forms of land use changed drastically from 1859 to 1880. Mining altered its form and requirements, farming expanded, and various services adjusted accordingly. Now it is time to see how the "man" in the man-land system reacted to these changes.

Mobility and Emigration

One of the most enticing, yet unobtainable, sets of data is that of emigration and population mobility. Due
to census taker inconsistencies and the sheer numbers of people in the Gold Country after 1848, charting the movement of individuals into, out of, and within the region is all but impossible. Nevertheless, an approximation can be made by sampling smaller units to determine spatial stability. To that end a limited population turnover test has been conducted.

Three census townships were sampled for 1860, 1870, and 1880. Bloomfield, White Oak, and Amador 4, were chosen to represent respectively a resurgent hydraulicking area, an agricultural township, and a quartz mining area. Every fourth male for each sample township in the 1860 and 1870 censuses was listed and then subsequent censuses checked for presence or absence in the same respective townships. Statistics for age and birthplace were taken as backup identifiers since mis-spellings and name duplication were common. Females were not sampled since marriage and name changes rendered some impossible to track. The statistics and conclusions for these samples are valid only for the three selected townships, but these serve as carefully chosen examples, hopefully representative of the trends taking place throughout the Central Mines.

The emigration of males from three townships from 1860 to 1870 was substantial. More than four of every five males present in 1860 were gone from these geographical units a decade later. The lowest emigration rate was from the agricultural township of White Oak, 81.8 percent. Greater
investment in land and infrastructure for farming and the reticence to hastily abandon it perhaps lowered the emigration rate here. Amador 4 experienced a rate of 85.4 percent, demonstrating the great difference in skills and, hence, personnel required for placer and quartz mining. Bloomfield, in northern Nevada County, lost 89.5 percent. This shows the slowness of recovery and the lesser labor requirements of hydraulicking as opposed to those of Amador 4's big quartz operations.

Although these emigration figures are extremely high, they do show a trend toward spatial stability. Historian Ralph Mann analyzed the turnover of population in Grass Valley and Nevada City, the two large Nevada County towns, from 1850 to 1860 and found rates of emigration for the two towns of 96 and 95 percent respectively. Virtually all of these declines occurred in the years 1850 to 1856, during the heyday of placer mining and its wild and unpredictable course (Mann 1972; 491-495).

This stabilizing trend continued in the decade 1870 to 1880, though emigration rates were still quite high. Amador 4 lost 79.1 percent of the males present in 1870 to lead the three townships. Quartz mining advanced during this period, but remaining placerers from this one successful surface-diggings area were further excluded by resource decline. Also, technical innovations slowed the growth of employment in the deep mines. With the establishment of
larger and more profitable hydraulic mining, Bloomfield's rate of emigration fell to 74.3 percent while agricultural White Oak lost 70.4 percent of its males.

Three conclusions can be drawn from these data. First, there was a trend toward greater population, spatial stability and decreased emigration of males. Mann's pioneering study for two other Central Mines geographical units showed a nearly complete turnover of population from 1850 to 1860. For the final decade analyzed, 1870-1880, the emigration figure had fallen to 75.8 for all three townships. Second, the townships' emigration statistics reflected the occupational types and success or failure patterns for the two decades. It appears that agriculture, with its stabler population, enabled White Oak to maintain a lower rate of emigration than either of the mining townships, despite the success both enjoyed. Finally, though the turnover rate declined, it was still very high. Three of every four males present in 1870 were gone by 1880. Despite the recovery of various land use functions, workers and other males continued to depart in large numbers. The information available from this sample is very limited and there is no way of knowing whether those who left moved to the next township or to another continent. Nevertheless, they did move enough (or die) to disappear from these politically prescribed geographical units. This indicates a high degree of mobility respondent to
cultural or economic stimuli. More research of this sort on mining and non-mining geographical units should be undertaken to establish frontier mobility and emigration rates for comparative purposes.

**Worker and Population Change, 1860-1880**

From the conclusions derived in the above test, one would expect a large drop in population and work force in the Central Mines region. This did not occur for two reasons. First, while an enormous percent of the 1860 workforce departed by 1880, there was replacement from other areas. Second, the number of unemployed dependents in the region increased during the two decades, swelling the population and ameliorating the impact of emigration by early pioneers.

In 1860, the census recorded 42,741 employed males in the study area. The number dropped nearly 43 percent to 24,414 by 1870. The average emigration rate for employed males in the three sample townships during that time, however, was approximately 85 percent. One of the three townships, Amador 4, actually increased its work force from 1860 to 1870 (Table 5-1). Therefore, large numbers of immigrants were filling the available work niches and even increasing the work force where conditions were favorable.
TABLE 5-1: Comparison of Emigration Rates and Work Force Change by Township

<table>
<thead>
<tr>
<th>Township</th>
<th>% of Males Emigrated 1860-1870</th>
<th>% of Males Employed 1860-1870</th>
<th>% of Males Emigrated 1870-1880</th>
<th>% of Males Employed 1870-1880</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amador 4</td>
<td>85.4</td>
<td>+13.6</td>
<td>79.1</td>
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</tr>
<tr>
<td>Bloomfield</td>
<td>89.5</td>
<td>-52.0</td>
<td>74.3</td>
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<tr>
<td>White Oak</td>
<td>81.8</td>
<td>-59.9</td>
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</tr>
</tbody>
</table>

While three of four males left the sample townships from 1870 to 1880, the work force for Amador 4 and White Oak remained fairly stable and Bloomfield experienced the full impact of the secondary boom caused by hydraulicking. Overall, then, replacement was more than adequate to overcome the emigration in the 1870s. In fact, the work force for the entire study area increased a slight three percent to 25,139 according to the 1880 census.

For the entire twenty years, the loss of males by death or emigration was more than 99 percent in the three townships. If we assume that these are representative of the entire region, then we can hypothesize a complete shift or removal of the original work force by 1880. The number of workers in the Central Mines declined by only 41 percent for the two decades. Hence, for every ten males who emigrated, six were replaced by new workers.

An increase in non-working dependents further lessened the effects of emigration from the Central Mines. With more established forms of mining and increased agriculture available, the lonely gold seekers and their tertiary and
primary co-workers began bringing their wives and families from home or hunting up brides in the area. The latter course, is an area still demographically skewed toward males, was not always easy, but became more feasible as new immigrants and generations added to the available pool.

The number of unemployed dependents in the Central Mines increased by approximately 5000 each decade from 16,739 in 1860 to 26,702 in 1880. A sign of growing importance of non-working dependents can be derived by dividing the number of workers into the total population. This dependent to worker ratio was 1.39 for the region in 1860. By 1870, however, it had increased to 1.89 and by 1880 to 2.06. Thus, at the end of the two decades the number of non-working residents of the Central Mines exceeded that of working males.

The combination of these factors maintained the total population at much higher levels than might be expected from the emigration data. There were 59,480 people residing in the township composing the study areas, according to the 1860 census. Ten years later, after the catastrophe of Comstock competition and the difficult adjustments forced on mining, and other economic functions, the census recorded 46,199, a drop of slightly over 22 percent. For the ensuing decade the population increased twelve percent to 51,841. The actual population decline for the two decades was only 12.8 percent, therefore, despite a virtually
complete turnover in male population, township by township. The problems affecting mining and other land use functions did lead to mass emigration and mobility. But, enough moved around within the study area or were replaced from outside to reduce the population loss to barely one in ten. The Central Mines still boasted a large population and a viable work force in 1880.

**Geographical and Demographic Variation in Population Replacement**

The turnover of population from 1860 to 1880 resulted in significant spatial and demographic changes. Some townships lost nearly three quarters of their population and workers while others grew. People concentrated in successful areas. Ethnic trends set in motion during the 1850s were reversed as American-born increased their proportion of the population. This trend occurred because of the increase of unemployed dependents, as the ratio of foreign-born to non-California, American-born workers remained stable.

The distribution of employed males within the 30 census township units, changed markedly (Table 5-2, Maps 5-1 through 5-3). Although the work force for the region dropped by nearly 43 percent from 1860 to 1870, some areas, including nearly all of El Dorado County--and the upper elevation portions of Placer and Nevada counties, far exceeded this figure. On the other hand, Amador County and the remaining portions of the two northern counties
### TABLE 5-2: CHANGES IN EMPLOYED MALES, 1860-1880

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MAP 5-1: PERCENT CHANGE IN EMPLOYED MALES 1860-1870 (BY TOWNSHIP)
MAP 5-2: PERCENT CHANGE IN EMPLOYED MALES 1870-1880
(BY TOWNSHIP)
MAP 5-3: PERCENT CHANGE IN EMPLOYED MALES 1860-1880
(BY TOWNSHIP)
were not as badly affected. Indeed, workers in four townships actually increased in number. The varied losses resulted from several trends of concentration. The five most populated townships increased their proportion of the total population from 32.7 to 41.9 percent. The composition of the leading five changed also as two El Dorado County units dropped out and were replaced by Placer 4 and Amador 1. This composition reflects the logical clustering around areas where the population base was high enough and economic activities sufficient to absorb some of the unemployed. A comparison of the figures for townships containing large towns reveals a similar trend. The seven townships containing Jackson, Sutter Creek, Placerville, Grass Valley, Nevada City, Auburn and Dutch Flat increased their share from 32.1 percent to 45.3 percent of the total work force.

In the following decade, nineteen of the thirty townships showed population increases, while eight of the remaining eleven declined less than twenty percent. Of the three that lost significant portions of their workers, two were upper elevation placering centers and one, Grass Valley, was a successful quartz center. The reasons for the latter are unclear. Omissions in the census are one possible factor while residential shift to nearby Nevada township and reduction of workers due to technological improvements in mining are other.
The rate of worker decrease from 1860 to 1880 was lessened for many townships by this partial recovery in the second decade. Ten still lost more than 60 percent, however, seven of those in El Dorado County. In 1880, the proportions of workers in the five largest townships and the seven urban ones had subsided slightly to 40.2 and 43.6 percent respectively. Although lower than the 1870 figures, they still exceeded the proportions for 1860.

The trends set in motion for workers were mirrored and even exceeded by those in the total population (Table 5-3, and Maps 5-4, 5-5, and 5-6). El Dorado County lost the largest proportion of their population as well as their workers. Consumnes township declined by 31.6 percent, the remainder by more than 40 percent. Those townships that showed increases included four areas of quartz mining, Grass Valley, Nevada, Amador 1 and Amador 4, two Central Pacific Railroad townships, Placer 4 and Washington, and Placer 9 on the edge of the Central Valley.

Spatial variation continued during the next decade, masked by the superficial stability of the entire region. Most townships increased population ranging in amount from 6.8 to 93.2 percent. Of the eleven units that suffered population losses, only two lost more than twenty percent, Eureka and Placer 6. Both were far from the major zones of settlement, transport, agriculture, and the resurgent forms of mining.
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MAP 5-5: PERCENT CHANGE IN TOTAL POPULATION 1870-1880
(BY TOWNSHIP)
MAP 5-6: PERCENT CHANGE IN TOTAL POPULATION 1860-1880 (BY TOWNSHIP)
The increases of the second ten years, plus those for seven townships in the first decade, combined to ameliorate the population losses for some townships while allowing increased variance among others. Nineteen of the thirty townships had population changes of greater magnitude for one decade than for the entire twenty year period. By 1880, however, Kelsey had lost two-thirds of its population while Amador 4 had grown by more than 116 percent. Seven townships lost over 1000 people while five others gained that many or more.

Concentration in larger areas, where successful conditions drew people and in areas with large towns was pronounced. The proportion of the population residing in the five largest townships increased from 33 to 42 percent while the urban centers claimed 33 percent in 1860 and nearly half in 1880. Three of the top five townships in 1860 and four in 1880 were also urban centers as well. Part of the reason for the increase in these large urban centers was the distribution of unemployed dependents. The ratio of dependents to workers in 1880 was 2.32 for the seven townships with large settlements. The remaining 23 units had a ratio of only 1.87.

The decade 1850 to 1860 had been one of increasing domination by foreign born in the Central Mines. The 1852 special census on California listed only 17 percent of residents in three counties (excluding El Dorado) as born outside the United States. By contrast, in 1860, the
percentage of foreign born for all four counties was 47.9. With unrestricted movement and a return home easier to manage, Americans were the first to abandon the placer fields in large numbers.

The trend reversed in the period 1860 to 1880. Foreign born people accounted for only 37.3 percent of the population of the four counties in the latter year. In order to understand how this change came about, an analysis of employed males (over 15 years old) recorded in the manuscript census was undertaken. The resulting data are useful for determining the distribution of various ethnic groups, assessing employment in various economic functions, and establishing preferences for different occupations by ethnic group. A detailed explanation of the sampling technique is provided in Appendix One. Censuses sampled were those for 1860, 1870, 1880, and 1900.

Foreign born workers accounted for 60 percent of the total employed males in 1860, while non-California-born Americans represented 39.7 percent. The ethnicity of the parents of California born workers is uncertain and, thus, for purposes of comparison this element of confusion was segregated. By 1880 foreign born still dominated the region with 54.2 percent and Americans made up 35.0 percent. Californians accounted for nearly 11 percent of the work force. The most interesting trend in these changes is that while both foreign born and non-California, American born declined in percent of the work force, they maintained
almost precisely the same ratio to each other. There were three foreign born workers to every two American ones in both 1860 and 1880. Hence, this reversal of the trend toward domination by foreign born was due primarily to an increase in American dependents.

Comparison to Larger Regions

A further measure of the changes in population wrought by massive emigration and replacement is the comparison of selected characteristics in the Central Mines to those of other regions. Comparisons for sex, age, and foreign birth between the Central Mines counties and all of California, the western eleven states and territories, comprising most of the territory designated in the 1880 census as frontier, and the nation were made for 1860 and 1880 (Table 5-4). Several conclusions are evident. First, population characteristics, particularly age and sex, shifted toward a balanced pattern, closer to those of the larger regions. Nevertheless, the ratio of male to female still show the effects of the gold rush with males composing two thirds of the population. This figure contributes to a correspondingly skewed state ratio, but contrasts sharply with the national statistic.

All early descriptions of the gold rush report an unusual concentration of young adults. By 1880, though, the age structure was representative of the state and the West,
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<td>25.1</td>
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<td>45.2</td>
<td>46.9</td>
<td>47.9</td>
<td>38.6</td>
<td>28.9</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>1880</td>
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<td>34.7</td>
<td>40.6</td>
<td>36.6</td>
<td>37.3</td>
<td>33.9</td>
<td>28.3</td>
<td>13.3</td>
</tr>
</tbody>
</table>
but still varied significantly from that of the entire country. California still showed some effects of the recent passing of its frontier era.

One final observation concerns foreign versus domestic born residents. While the disparity decreased markedly during the two decades, the proportion of foreign born in the study area still exceeded those for the larger regions. The figures for foreign born in the nation contrasts sharply with those of the West and California as well. As noted, in the Central Mines, the foreign workers inflated the proportion of foreign born in the population. Since other parts of California and the West had similar extractive economies, an hypothesis can be advanced that those occupations in frontier and recent post-frontier areas account for high concentrations of foreign born. This will be tested for Central Mines in the next chapter.

A huge number of people emigrated from the Central Mines during the two decades following the Comstock discovery. But, replacement by new workers and their dependents lessened the impact of this emigration allowing some townships to grow while others experienced large declines. Spatial shifting toward zones of higher population and opportunity resulted, and the demographic characteristics changed with uneven replacement, the evolution of families, and a more balanced and settled population. The many changes taking place in the Central Mines commanded great adjust-
ments by its population. In the next chapter we will continue this analysis answering the question--"Why did the new workers immigrate?"
FROM BOOM TO BUST:  
POST GOLD RUSH PATTERNS OF ADJUSTMENT  
IN A CALIFORNIA MINING REGION  
Volume II  

A Dissertation  
Submitted to the Graduate Faculty of the  
Louisiana State University and  
Agricultural and Mechanical College  
in partial fulfillment of the  
requirements for the degree of  
Doctor of Philosophy  
in  
The Department of Geography and Anthropology  

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Lary Michael Dilsaver  
B.A., California State University, Hayward, 1971  
M.A., California State University, Hayward, 1977  
May 1982
CHAPTER 6
CHANGES IN OCCUPATIONAL STRUCTURE, 1860 TO 1880

In the last chapter, the results of a test on emigration from three example townships suggested a substantial departure of males from the region. Worker and population statistics from census manuscripts, however, indicate that many of these emigrants were replaced by new workers and their dependents. There were many reasons for migrating to a new area on the western frontier, including amenities, cultural affinity, religious or ethnic opportunity or escape, salubrity, or political freedom (Billington 1966; 23-46). An analysis of contemporary writings had revealed that these factors were not important in the Central Mines area. As on most frontier and immediate post-frontier regions, economic opportunities, real or perceived, governed population movement. The Comstock and other boom areas experienced their own setbacks by 1864. Thousands of disappointed souls abandoned them, some of whom wandered to California. Immigration from the East and elsewhere, meanwhile, continued to bring first-time opportunities and a few returning pioneers. They sought a new life—a new livelihood in the Golden State.

Previous chapters have demonstrated that the period 1859 to 1880 was one of dynamic change for all forms of economic activity. Mining underwent drastic changes technologically, spatially, and in organizational requirements.
Some activities increased in importance or production, such as agriculture and transport, while others declined. The purpose of this chapter is to assess the change in relative importance of various types of economic activity by analysis of employment and population dependence. In other words, to determine why new immigrants came to the region, when so many others were departing.

Four specific questions are to be answered by this analysis: (1) What class of occupation was the most important employer? Six broad categories were selected—mining, agriculture (including gardening), laborer, transport (including all railroad workers and laborers), lumbering and a catch-all class called other. The latter includes primarily tertiary workers other than those already designated.

(2) What class of occupation was the most important supporter of population? A separate analysis for dependents, both working and non-working, yielded data not only on the relative importance of a set of economic functions to the population, but on comparative family size as well.

(3) What were the spatial patterns for these occupations and how did they change from 1860 to 1880? With the significant changes each form of land use underwent during this period, we should expect notable changes in their spatial patterns of employment and dependence.

(4) What ethnic patterns were associated with each occupational class? The ethnic composition of the region
changed during the two decades. The reasons for this are perceptible by closer analysis of occupational ethnicity and its spatial patterns.

The data for this analysis came from the census manuscripts, collected as described in chapter five and Appendix One. The chapter is organized by occupational class, and the above four questions are addressed in each section. Following this data presentation, the spatial, ethnic, and occupational patterns for the region are compared to those of the state, the West, and the nation.

**Multiplicity of Occupations**

Before beginning the discussion of employment changes in the gold country, it is important to note an inherent but unavoidable weakness in the analysis. This weakness is caused by occupational multiplicity for an individual, either seasonal or permanent. Evidence for this phenomenon is available from a number of sources, several of which are presented in this section.

The Federal census for the years 1860, 1870, 1880, and 1900 include a designation of occupation for most adult males and some females. Theoretically, the listed occupation was the primary if not sole means of support for this individual and his unemployed dependents. There are two problems, however, in basing an analysis on this data base. First, though the listed occupation was supposed
to be main income provider, some individuals may have classed themselves in a more prestigious or desirable occupation. A local merchant having received the honor of a judgeship might class himself accordingly, though his income still derived from his store. The degree to which this occurred, the ability and inclination of a local, census taker to ignore this and put down the truth, and the possible variation in space and time can never be known. This is a weakness in the data base that cannot be overcome and must not be allowed to hamper the analysis. The census still remains the primary and most reliable source of population information (Sabaugh 1943).

A second, probably more common, problem was the occurrence of double job listings for individuals. Enough confusion apparently existed in some workers' minds that they reported two occupations to the census taker. The analysis undertaken for this study shows that the percentage of individuals listed in this fashion varies with most showing few to none. One, Amador 1, in 1870, reported five percent of employed males in this fashion. The question then arises, is this the result of an ambitious census taker, willing to write all this out, or is this an unusually diversified occupational group? A careful check of the recorded dual listings shows a slight preference for miner-farmer or farmer-miner, but all combinations appear. From this, we can hypothesize that no single occupation is
given priority in the analysis. In this study, the first occupation listed was assumed to be the major one, and the other necessarily ignored.

A careful examination of the manuscript records of Abraham Darlington, an El Dorado County resident from 1853 to the 1890s, illustrates occupational multiplicity on a seasonal basis. Darlington began as a miner, but quickly gave it up in favor of farming. He steadily acquired land amounting to 237 acres by 1880. In addition, he opened and operated a supply store in Shingle Springs and employed two men to quarry and transport soapstone from his land. Though classified as a farmer, he could as easily have been called a merchant or quarryman. Darlington was assured of a reasonable income from these three sources. For the men who worked for him, making a living was more difficult and occasioned even greater reliance on multiple occupations. Darlington employed the equivalent of two full time laborers. Only one man, however, was employed throughout the year. The remainder of a full-time, year's worth of hours were divided between nine locals. As many as six men worked at once during periods of intense activity such as digging irrigation ditches, flooding the fields for new soil, planting, and harvesting the 17 acres of crops and orchards. The rest of the time, these men engaged in a variety of activities described by Darlington in his journal. Several owned their own farms and tended
them. Some cut lumber for sale to the railroad and mines; some mined for gold; some became teamsters; a couple worked as laborers in towns. These men, including the farm owners, divided their employed time widely to obtain the money needed to live and support families. Several of Darlington's employees were classed as laborers in the census, most as farmers or farm laborers. At various times, however, they were teamsters, miners, and lumberers.

The most common dual occupation was farming with occasional mining. Commonly, after planting or harvesting, the landowner used his free time to return to a local creek or ridge with his simple tools and engage in placer mining once again. The amount of gold taken in this fashion was insignificant, but it provided capital for otherwise unavailable luxuries. In his diary and letters, El Dorado County farmer, Lucas Willey (1852-1873), wrote that he and other local farmers often located their farms with this reserve occupation in mind. Willey farmed in the same area he had mined earlier, and returned to pan and sluice whenever the opportunity presented itself.

Evidence for seasonal shifts in occupation is also available from corporate records. Water and ditch companies, hydraulic mines, and even some quartz mines shut down during part of the year. The California Iron Company, located at Clipper Gap in Placer County could not operate at full capacity year round because, "in winter when work is
scarce in the valleys, the number of hands is increased for mining and charcoal burning. In summer, of course, these seek the better prices and somewhat easier work of harvesting" (Angel 1882; 211).

The above evidence serves as a disclaimer for the occupational breakdown to follow here and in chapter nine. Because the census listing reported what an individual regarded as his chief source of income, because double listings showed no discernible preference for one set of occupations, and because it is impossible to obtain a more detailed breakdown of support derived from piecemeal and seasonal activities, this analysis rests on the census record. It is simply noted here that an indeterminate amount of error exists due to these factors.

**Mining**

A great exodus of miners followed the news of silver in Nevada. Contemporary sources reported that whole towns and regions were nearly depopulated (Paul 1947; 180-181). Measurement of this decline in the census population manuscripts confirms the magnitude of this exodus. From 1860 to 1870, the population of men engaged in mining decreased by more than 55 percent. Most miners departed in the early years of the decade before quartz and hydraulic mining became established as viable alternatives. El Dorado County, scene of many glorious strikes in the
earliest years of the rush, was hit hardest losing slightly more than 70 percent of its mining work force. Every township in the region but one declined (Table 6-1). Ironically, it was Placer 9 on the edge of the agricultural Central Valley that increased, due largely to an influx of Chinese placerers denied access to other regions.

From 1870 to 1880, mining reestablished itself, expanding in both distribution and production. But the technological advances that allowed this expansion required less manpower per unit of ore mined and milled. Hence, although gold mining improved, the number of miners continued to decline. The population of miners in the Central Mines region decreased by 9.9 percent during the decade. The biggest decline, a drop of 20.4 percent, came in Placer County where agriculture made significant competitive gains, and many Chinese miners departed after a slight relaxation of geographical discrimination. Nevada County continued to show the smallest decrease, buoyed by its combination of lucrative quartz mines and rich Yuba River Tertiary gravels.

The regional decline of more than 16,000 was nearly 60 percent for the twenty years. Every census township in the region lost miners. The spatial pattern was highly uneven, however, due not only to the fortunes of quartz and hydraulic mining but also the size and base population of these political units (Maps 6-1 and 6-2). Townships with the largest areas were among those that lost the greatest
### TABLE 6-1: NUMERICAL AND PERCENT CHANGE OF MINERS, BY TOWNSHIP

<table>
<thead>
<tr>
<th>Township</th>
<th>Miners</th>
<th>Changes</th>
<th>Miners</th>
<th>Changes</th>
<th>Miners</th>
<th>Changes</th>
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<td>1970-80</td>
<td>1880</td>
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<td></td>
<td></td>
<td></td>
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<td>12,079</td>
<td>-9.9</td>
<td>10,885</td>
<td>-59.6</td>
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</tbody>
</table>
MAP 6-1: DISTRIBUTION OF MINERS, 1860

one dot = 50 miners
MAP 6-2: DISTRIBUTION OF MINERS, 1880

one dot = 50 miners
number of miners. Amador 3, Diamond Springs, and Georgetown in El Dorado County, and Eureka and Grass Valley in Nevada County each lost more than 1000 miners.

Even successful townships were not immune to large decreases in miners. Most units in failing El Dorado County lost more than 65 percent of their miners. But, the successful Amador County quartz center around Jackson lost an equally high percent. This county had been a rich placering area and one of the earliest zones of quartz development, but the work force required to mine underground was very low by comparison to placering. All but the rich zone around Sutter Creek showed substantial declines in miners.

Six townships lost less than 35 percent of their miners. Four were mixed hydraulic-quartz areas in Nevada County, one the aforementioned Sutter Creek area in Amador County, and the sixth, Placer 3, had so few to begin with that a modest influx of Chinese placerers kept the area relatively stable.

Miners logically clustered around workable areas. The five townships that contained the largest number of miners in 1860 accounted for 31 percent of all those in the region. By contrast, 39 percent of the region's miners worked the five leading townships in 1880.
Dependence on Mining

The number of persons depending on mining for support fell dramatically from 1860 to 1880, but did not approach the magnitude of decrease of employed miners. This amelioration of decline was due to an increase in non-working dependents, mainly women and children. Miners working corporate forms of mining, particularly quartz operations, began to bring families from home if they had them, or initiate new ones if not.

The total number of persons dependent on mining, including the miners themselves, changed from 35,450 to 20,835, a 41 percent decline from 1860 to 1880. All of this decline occurred in the first decade. The latter ten years actually showed a three percent increase. The number of unemployed dependents on mining, however, increased 17 percent from 8493 to 9950. Thus, it was the collapse of the mining-employed sector of the population that accounted for not only the decline in total dependents, but erased the increase in non-working dependents as well. The ratio of mining dependents to miners was a mere 1.32 in 1860. By 1880, it had risen to 1.91. During the early years of this period, there was but one unemployed dependent for every three miners. In 1880, the ratio was nearly one to one. The units with the largest ratio of dependents to miners were those that combined employment in mining with amenities (Table 6-2). Among these were
### TABLE 6-2: TOTAL POPULATION SUPPORTED BY MINING, 1860-1880

<table>
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<tr>
<th></th>
<th>Number in 1860</th>
<th>Ratio to Miners</th>
<th>Number in 1870</th>
<th>Ratio to Miners</th>
<th>Number in 1880</th>
<th>Ratio to Miners</th>
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<td>555</td>
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<td>285</td>
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<td>310</td>
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<td>185</td>
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<td>575</td>
<td>1.8</td>
<td>630</td>
<td>1.7</td>
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<td>1.2</td>
<td>345</td>
<td>1.4</td>
<td>405</td>
<td>1.6</td>
</tr>
<tr>
<td>KEL</td>
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<td>160</td>
<td>2.0</td>
<td>255</td>
<td>1.4</td>
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<td>180</td>
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<tr>
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<td>1.3</td>
</tr>
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<td></td>
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</tr>
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<td>565</td>
<td>1.3</td>
<td>305</td>
<td>1.9</td>
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<td>3,440</td>
<td>2.0</td>
<td>3,080</td>
<td>3.0</td>
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<tr>
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<td>R&amp;R</td>
<td>865</td>
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<td>405</td>
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<td>550</td>
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<td>WAS</td>
<td>445</td>
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<td>1.5</td>
<td>360</td>
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</tr>
<tr>
<td>Placer---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>840</td>
<td>1.2</td>
<td>385</td>
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<td>500</td>
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<td>3</td>
<td>555</td>
<td>1.5</td>
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<td>385</td>
<td>1.5</td>
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<td>5</td>
<td>1,340</td>
<td>1.3</td>
<td>575</td>
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<td>735</td>
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<tr>
<td>6</td>
<td>1,245</td>
<td>1.2</td>
<td>635</td>
<td>1.5</td>
<td>385</td>
<td>1.8</td>
</tr>
<tr>
<td>7</td>
<td>1,290</td>
<td>1.3</td>
<td>480</td>
<td>1.7</td>
<td>595</td>
<td>1.7</td>
</tr>
<tr>
<td>9</td>
<td>680</td>
<td>1.5</td>
<td>485</td>
<td>1.0</td>
<td>430</td>
<td>1.9</td>
</tr>
<tr>
<td>TOTAL</td>
<td>35,450</td>
<td>1.3</td>
<td>20,295</td>
<td>1.7</td>
<td>20,835</td>
<td>1.9</td>
</tr>
</tbody>
</table>
the townships containing the mineral and service centers of Jackson, Sutter Creek, Placerville, Nevada City, Grass Valley, and Dutch Flat. The major successful hydraulicking area along San Juan Ridge in Bloomfield and Bridgeport townships was also so favored. The old placer centers, incapable of adequately adapting due to resource poverty, showed low ratios of dependents to miners. Areas such as Coloma, Diamond Springs, and Salmon Falls, were tough areas to make a living by mining. One could ill afford to attempt supporting a family as well.

With increased unemployed dependents, the population supported by mining slowed its downward spiral. Five townships, Sutter Creek and four quartz or hydraulic centers in Nevada County, actually enjoyed increases. Many still looked to gold as the foundation of their livelihoods.

Ethnic Analysis of Mining

Several changes in the ethnic structure of the mining work force occurred during these years (Table 6-3). The three most important changes involved three different ethnic groups, each with vastly different roles and influences in the industry. Each, in turn, occasioned distributional changes.

(1) The number and relative importance of American born miners decreased;

(2) Chinese miners continued to be excluded from
<table>
<thead>
<tr>
<th></th>
<th>America</th>
<th>California</th>
<th>Foreign</th>
<th>Britain</th>
<th>Ireland</th>
<th>Germany</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study</strong></td>
<td>1860</td>
<td>30.7</td>
<td>0.1</td>
<td>69.2</td>
<td>14.2</td>
<td>10.1</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td>1870</td>
<td>26.5</td>
<td>0.2</td>
<td>73.3</td>
<td>18.9</td>
<td>12.1</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td>1880</td>
<td>23.9</td>
<td>6.8</td>
<td>69.3</td>
<td>19.1</td>
<td>7.3</td>
<td>6.6</td>
</tr>
<tr>
<td><strong>Area</strong></td>
<td>1860</td>
<td>27.6</td>
<td>0.2</td>
<td>72.2</td>
<td>5.5</td>
<td>7.8</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>1870</td>
<td>22.1</td>
<td>---</td>
<td>77.9</td>
<td>7.8</td>
<td>7.8</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>1880</td>
<td>17.0</td>
<td>6.4</td>
<td>76.6</td>
<td>15.6</td>
<td>6.1</td>
<td>12.4</td>
</tr>
<tr>
<td><strong>Amador</strong></td>
<td>1860</td>
<td>33.4</td>
<td>0.2</td>
<td>66.4</td>
<td>5.6</td>
<td>6.1</td>
<td>7.6</td>
</tr>
<tr>
<td><strong>County</strong></td>
<td>1870</td>
<td>31.6</td>
<td>0.5</td>
<td>67.9</td>
<td>9.7</td>
<td>5.5</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>1880</td>
<td>30.8</td>
<td>6.5</td>
<td>62.7</td>
<td>9.6</td>
<td>2.7</td>
<td>7.7</td>
</tr>
<tr>
<td><strong>El Dorado</strong></td>
<td>1860</td>
<td>44.0</td>
<td>---</td>
<td>56.0</td>
<td>15.1</td>
<td>15.5</td>
<td>3.4</td>
</tr>
<tr>
<td><strong>County</strong></td>
<td>1870</td>
<td>25.7</td>
<td>0.2</td>
<td>74.1</td>
<td>32.2</td>
<td>15.7</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>1880</td>
<td>22.2</td>
<td>6.7</td>
<td>71.1</td>
<td>29.4</td>
<td>10.4</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Nevada</strong></td>
<td>1860</td>
<td>36.9</td>
<td>0.2</td>
<td>62.9</td>
<td>9.2</td>
<td>10.6</td>
<td>10.4</td>
</tr>
<tr>
<td><strong>County</strong></td>
<td>1870</td>
<td>25.5</td>
<td>0.2</td>
<td>74.2</td>
<td>10.7</td>
<td>8.4</td>
<td>9.9</td>
</tr>
<tr>
<td></td>
<td>1880</td>
<td>25.5</td>
<td>8.0</td>
<td>66.5</td>
<td>11.4</td>
<td>7.2</td>
<td>7.5</td>
</tr>
<tr>
<td><strong>State</strong></td>
<td>1850</td>
<td>76.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
rich claims and moved frequently in search of placers they could work unmolested.

(3) The number of British miners, composed mainly of Cornish quartz miners, increased substantially.

Americans

The number of Americans in the mining labor force had dropped precipitously in the later years of the 1850s. This trend accelerated in the ensuing two decades and left the non-Californian Yankee miner composing barely one-fifth of the mining-force in 1880, despite emigrations of foreign-born miners as well.

The quartz mining centers of Amador and Nevada Counties recorded the lowest percents of American miners, while counties with placer and hydraulic mining did somewhat better. Americans were generally ill-prepared and ill-disposed to the difficult and unpleasant task of quartz mining, although they often acted as supervisors and mill-men. They played a greater role in surface mining, particularly hydraulicking (Paul 1947; 322-323). Americans made up nearly half the miners in Bloomfield township despite the presence of numerous Chinese placerers. Hydraulicking however, employed far fewer men than quartz mining. This was amply demonstrated by Nevada County. Both hydraulic and quartz mining enjoyed their greatest successes in this
rich mineral territory. The ratio of Americans to foreigners decreased by half, though, as various foreigners flocked to the huge quartz operations around Grass Valley and Nevada City.

**Chinese**

The role of the Chinese in the Central Mines economic system from 1850 to the 1880s is unclear. Contemporary reports and editorials viewed them as having a considerable and detrimental impact. But, due to discrimination, they generally worked areas where they could be left alone, that is where nobody else wanted to mine. By their sheer numbers they should have had a significant multiplier effect on local economies. Due to their cultural patterns, enforced by external pressures and threats, they operated as a nearly closed cultural system within the framework and geographical base of the Sierran and Californian mainland systems.

The first Chinese were a distinct curiosity when they began arriving in late 1849. Numbering only 55 out of 57,787 miners in 1850, they were regarded as unusual, often amusing, but treated hospitably (Chinn 1969; 30). Chinese immigration increased sharply, however, in 1851, to 2700. For the first time their presence and habits began to attract undesirable attention (Chiu 1963; 13). This immigration was a pale precursor of the one to follow. More than 20,000
Chinese passed the San Francisco Custom House bound for the mines during 1851. For the next three decades immigration fluctuated as tens of thousands poured into the mining regions (Table 6-4). The novelty quickly ended and the white miner, both American and foreign born, found the Chinese an unwelcome source of competition and annoyance.

Culturally, the "Celestials" were a source of interest and usually intense distaste to Americans and other caucasians. In the eyes of Westerners, they had annoying and incomprehensible habits, many of which appeared threatening. One of these characteristics was their intense clannishness. Whites regarded this gregarious habit as evidence of conspiracy and the imminence of nefarious activities. However, it was due at least partially to an old country system of geographical guilds or companies, six of which operated in California. The Chinese Six Companies, with headquarters in San Francisco, represented five departments of Kwangtung Province, from which nearly all California Chinese came, plus a catch-all grouping of others. Control was in the hands of San Francisco merchants and a membership fee of ten dollars was charged all who joined. The companies included practically all of the Chinese in the state. They provided all the benefits of a communal organization including financial aid and assurance to each Chinese man that his body would be returned to the homeland and buried, should he die in the New World (Sandmeyer 1939; 23-23).
### TABLE 6-4: CHINESE ARRIVALS AT THE SAN FRANCISCO CUSTOMS HOUSE

<table>
<thead>
<tr>
<th>Year</th>
<th>Arrivals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1852</td>
<td>20,026</td>
</tr>
<tr>
<td>1853</td>
<td>4,270</td>
</tr>
<tr>
<td>1854</td>
<td>16,084</td>
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<td>1855</td>
<td>3,329</td>
</tr>
<tr>
<td>1856</td>
<td>4,807</td>
</tr>
<tr>
<td>1857</td>
<td>5,924</td>
</tr>
<tr>
<td>1858</td>
<td>5,427</td>
</tr>
<tr>
<td>1859</td>
<td>3,175</td>
</tr>
<tr>
<td>1860</td>
<td>7,341</td>
</tr>
<tr>
<td>1861</td>
<td>8,430</td>
</tr>
<tr>
<td>1862</td>
<td>8,175</td>
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<td>1863</td>
<td>6,432</td>
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<td>1868</td>
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<td>1869</td>
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<td>10,870</td>
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<td>1871</td>
<td>5,540</td>
</tr>
<tr>
<td>1872</td>
<td>9,770</td>
</tr>
<tr>
<td>1873</td>
<td>17,075</td>
</tr>
<tr>
<td>1874</td>
<td>16,085</td>
</tr>
<tr>
<td>1875</td>
<td>18,021</td>
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<td>1876</td>
<td>15,481</td>
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<td>1877</td>
<td>9,468</td>
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<tr>
<td>1878</td>
<td>6,675</td>
</tr>
<tr>
<td>1879</td>
<td>6,969</td>
</tr>
<tr>
<td>1880</td>
<td>5,950</td>
</tr>
<tr>
<td>1881</td>
<td>18,561</td>
</tr>
<tr>
<td>1882</td>
<td>26,902</td>
</tr>
<tr>
<td>1883</td>
<td>8,000?</td>
</tr>
</tbody>
</table>
| 1884 | 4,000?     

(After: Sandmeyer, 1939)
The Chinese miner, like most others who came to the gold fields, intended to make enough money to better his life and then return home. The Chinese, however, refrained from spending money on local supplies as much as possible and on Western-owned amusements completely. Even many of their food products were grown in small gardens or imported from Asia (Chinn 1969; 35). This lack of return investment in the local economy annoyed white miners and fueled the argument that the Chinese should be heavily taxed, if not entirely excluded.

The personal habits of Chinese were reproached loudly, in particular their morals. Caucasians regarded them as filthy, squalid, and evil-odored. Worse they were viewed as "heathens" who smoked opium and pushed their women into prostitution. They were widely suspected and accused of robbing sluices and punishments ranging from fifty lashes to hanging were meted out without trial when suspicion could be aroused (Dufault 1969; 162-165).

The most damaging factor in Chinese-White relations in the gold country, as well as statewide, resulted from the very industry and persistence of the former. Competition for land in the form of claims was keen in a successful mineral zone, and the Chinese were regarded for the above reasons as unfit to participate. Their ability to make the most from limited resources and opportunities led them to accept very low wages. The competition engendered by this fact caused numerous instances of brutal mistreatment.
Anti-Chinese legislation, in the form of foreign-miner taxes and measures to prevent land and claimholding appeared widely in the various mining districts by 1852. Chinese miners faced a difficult path to their gold, but somehow they succeeded.

For these reasons, the Chinese did not participate in all the changes that took place in mining from 1860 to 1880. They were conspicuously absent from the labor force employed in quartz mining. The manuscript census lists no Chinese specifically as quartz miners. Key quartz mining centers were controlled by the Cornish, Welsh, and Irish, with American workers in the mills and at the flumes. All of these groups loathed the Chinese laborer and feared low-salaried competition. One of the main sources of contention between workers and mine owners in the labor strikes of 1869 and 1872 was the potential hiring of Chinese labor, experienced in the use of blasting powder after work on the railroad. The strike was a failure in its efforts to ban the use of technological labor saving devices and to prop up the wage scale. Labor achieved one success, though. Employers promised not to hire Chinese workers (Chiu 1963; 32-33).

Chinese workers operated successfully as drift and hydraulic miners, particularly the latter. The undisputed forte of the Chinese miner, however, was placer mining. More than 95 percent of all those listed as placer miners
in the census were Chinese. Whether or not this was due to discrimination and the exclusion from other methods, the Chinese placerer was a nearly ubiquitous and successful element of the mining population. Their success was not measured by any accruements of conspicuous wealth, but rather by the fact that they made a living at all from the material they worked. Local legislation to prevent Chinese from owning remunerative claims reinforced segregation. In areas where de jure segregation was not present, whites practiced de facto denial of claimholding with no fear of legal punishment. Chinese miners were restricted largely to areas that had been abandoned by whites or to the tailings from mines operated by Americans and Europeans (Ibid.; 33). Somehow from these worked over, miserable sources the Chinese miner eked out enough gold not only to live on, but to finance his passage, alive or dead, back to China, pay dues to his "company", and even send money home to relatives.

Most Chinese miners worked as individuals or in small teams, due to the necessity of operating on a small and mobile scale. Improvements requiring a large labor force might have been made more often but for the ever present threat of white miners who might force a move at any time (Chiu 1963; 24-25). Some Chinese companies did appear by 1865, but they were still fairly small. Most Chinese companies employed from 15 to 20 workers, owned a claim of
two or three thousand dollars, exclusive of equipment, and engaged in hydraulic or drift mining (Ibid.; 31).

Chinese miners continued to make up approximately one-fourth of the mining labor force in the study area, but their numbers declined dramatically. Data from the sampled manuscript census shows a decrease of 63 percent from 1860 to 1880, a decrease that varied among the counties (Table 6-5).

<table>
<thead>
<tr>
<th>County</th>
<th>1860</th>
<th>1870</th>
<th>1880</th>
<th>% Decline 1860-1880</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amador</td>
<td>19.1</td>
<td>20.0</td>
<td>16.3</td>
<td>-68</td>
</tr>
<tr>
<td>El Dorado</td>
<td>42.6</td>
<td>25.9</td>
<td>27.3</td>
<td>-76</td>
</tr>
<tr>
<td>Nevada</td>
<td>19.7</td>
<td>26.9</td>
<td>36.1</td>
<td>-32</td>
</tr>
<tr>
<td>Placer</td>
<td>18.6</td>
<td>27.2</td>
<td>20.3</td>
<td>-59</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>-63</td>
</tr>
</tbody>
</table>

El Dorado County lost the greatest number of Chinese as total number of miners. The successful hydraulicking operations on the Yuba River attracted numerous Chinese miners either as employees of the companies or as placerers working the debris tailings and small claims on the Tertiary ridges. Thus, Nevada County experienced the lowest decline.

The Chinese formed a visible and integral part of the mining landscape, yet one which had little impact on the system. External pressure and traditional social preference kept the Chinese to themselves. They worked the
tailings and river bars for scraps of gold missed by an earlier generation of white miners. They accounted for more than one-fourth of all the men mining in the region. They were mobile, self-sufficient, and remarkable in their capacity to make a living from next to nothing, virtues that were to eventually lead to their exclusion from the mines altogether.

**Cornish**

While the Chinese survived in the Central Mines region as a reviled group of small-time placerers, the Cornish became the respected backbone of quartz mining in the Sierra Nevada foothills. Their expertise was legendary, and they were sought by quartz companies of both American and English ownership. The role they performed as teachers of mining methods was even more crucial than the work they actually did, blasting, drilling and digging ore from beneath the surface. Their number increased steadily despite some emigration from California to new fields around the world. The experience of the Cornish miner was a complete contrast in almost every way to that of the Chinese.

Cornishmen had mined in hard rock for centuries when gold was discovered in California. Ancients like the Greeks and Romans undertook hazardous voyages to trade for tin dug in pre-historic Cornwall. When news of Marshall's find reached the East and Europe, some seven thousand "Cousin
"Jacks" were already mining lead in Wisconsin and Michigan. The pattern of emigration to new mining areas was already established by 1849 (Harries 1956; 27-28).

The migration of Cornish to California cannot be accurately determined because they were never recorded separately from the English and Welsh. Still, some estimates have been made and most number well into the thousands. Of the seven thousand mining lead in the Wisconsin field, about two-thirds are believed to have left for California. Most made the trek back to the Atlantic shore and then booked sea passage to San Francisco rather than make the overland journey (Rowe 1974; 112-113). Thousands of hopefuls, meanwhile, journeyed directly from the British Isles, including a large proportion that hailed from Cornwall (Harries 1956; 30-32). Many who came to California in the early years left again for Australian, Canadian, and other American mineral strikes. An indication of the number who may have stayed, though, is provided by Rowe (1974; 113). He estimates that "probably at least a thousand of those who came from Wisconsin did not return to the Badger State but settled in the Mother Lode country."

Incipient quartz mining drew the remaining Cornish miners together and by 1860 they clustered in a few favorable locations including Rough and Ready, Nevada City, Auburn, Georgetown, Placerville, and Coloma (Todd 1967; 57). The greatest concentrations, though, were at Grass Valley,
where some estimates put the number of Cornish miners in 1870 as high as 800, and at Sutter Creek (Rowe 1974; 113).

A second wave of Cornish immigration directly from Cornwall began in the early 1870s. This time a major depression in the copper mines at home overshadowed the lure of California gold (Harries 1956; 50). This immigration reinforced Cornish numbers and influence at precisely the time the quartz mines made significant strides toward increased production. Most of the new arrivals congregated in established communities of countrymen where their cultural values and particular occupational skills were fostered and practiced. This second Cornish immigration continued until the turn of the century. In the process, several communities, such as Grass Valley, took on a distinctly foreign air and appearance. In 1910, one observer noted that a full three-fourths of the 5000 to 6000 inhabitants of Grass Valley were of Cornish birth or descent (Ibid.).

Two other factors contributed to the Cornish immigration to the Sierra Nevada foothills. English mining companies invested in CentralMines quartz companies, particularly in Grass Valley, and brought Cornishmen to supervise and work their mines. Also, hard rock mining conditions at Grass Valley resembled those in Cornwall. Miners in both areas had to contend with water problems in the mines and ore characterized by metamorphosed rock containing narrow veins (Ibid.).
The contributions of Cornishmen to hard rock mining in California went well beyond the actual work of bringing up ore and extracting gold in the deep mines. Among the tangible contributions to knowledge and technology were:

(1) The Cornish pump which kept the mines dry and protected from seepage of ground water,
(2) The art of sinking a shaft through all types of material, including quicksand, credited to a Cousin Jack in Grass Valley;
(3) The use of waste rock and other materials as wall props;
(4) Expertise in the use of blasting powder for loosening rock ledges;
(5) Methods of drilling, particularly the complicated two-handed method;
(6) Some methods of administration and "front-office" operation, were introduced or devised by Cornish foremen and supervisors in the early years and among the British owned corporations (Ibid.; 79-89).

These contributions appear even more significant when the Cornishmen and their expertise are viewed in light of the mining knowledge and skill available at that time and place. Quartz mining saved many of the original towns of the Central Mines region and was without question the
greatest employer of any of the five forms of mining. This branch of the industry owed its start, when capital was sparse and competition fierce, to some successes made possible by Cornish knowledge and skill. When the industry recovered from its early 1860s depression and began serious expansion, the Cousin Jack was available to staff the largest and most productive endeavors and continue to lend his uncanny abilities to the hunt for gold in the Central Mines.

**Agriculture**

Agriculture underwent a steady increase and geographical expansion from 1860 to 1880. The number of farms and amount and value of production increased at a rate that, though slow by Central Valley standards, showed a healthy interest in the region for farming. This increased role of agriculture is reflected in the population figures as well. An increase of farmers, farm laborers, and gardeners amounting to 39.1 percent accrued from 1860 to 1880 (Table 6-6).

The number of farm workers and other agriculturalists in the region was 2757 in 1860, as reconstructed from the sample. More than 520 were added by 1880. This growth in agricultural employment was uneven geographically. Some townships lost farmers almost as fast as miners (Map 6-3). Agricultural employees decreased the most in two broad
<table>
<thead>
<tr>
<th>Employed Males</th>
<th>1860</th>
<th>Percent Change</th>
<th>1870</th>
<th>Percent Change</th>
<th>1880</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
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<td>No. in Agriculture</td>
<td>2,757</td>
<td>+19.1</td>
<td>3,284</td>
<td>+16.81</td>
<td>3,836</td>
<td>+39.1</td>
</tr>
<tr>
<td>% in Agriculture</td>
<td>6.45</td>
<td>13.45</td>
<td>15.26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. in Labor</td>
<td>2,829</td>
<td>-43.9</td>
<td>1,586</td>
<td>+73.6</td>
<td>2,753</td>
<td>-2.7</td>
</tr>
<tr>
<td>% in Labor</td>
<td>6.62</td>
<td>6.50</td>
<td>10.95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. in Transport</td>
<td>872</td>
<td>+12.6</td>
<td>982</td>
<td>+13.1</td>
<td>1,111</td>
<td>+27.4</td>
</tr>
<tr>
<td>% in Transport</td>
<td>2.04</td>
<td>4.02</td>
<td>4.42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. in Lumbering</td>
<td>430</td>
<td>+60.9</td>
<td>692</td>
<td>-20.7</td>
<td>549</td>
<td>+27.7</td>
</tr>
<tr>
<td>% in Lumbering</td>
<td>1.01</td>
<td>2.83</td>
<td>2.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. in Other</td>
<td>8,896</td>
<td>-34.9</td>
<td>5,790</td>
<td>+3.7</td>
<td>6,006</td>
<td>-32.5</td>
</tr>
<tr>
<td>% in Other</td>
<td>20.81</td>
<td>23.72</td>
<td>23.89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Employed Males</td>
<td>42,741</td>
<td>-42.9</td>
<td>24,414</td>
<td>+2.97</td>
<td>25,139</td>
<td>-41.2</td>
</tr>
</tbody>
</table>
MAP 6-3: PERCENT CHANGE IN AGRICULTURAL WORKERS 1860-1880 (BY TOWNSHIP)
areas. Seven townships in El Dorado County lost a combined 21 percent of their farm workers, due to the great decline in the local market and usurpation of the supply role to Nevada by the Central Pacific Railroad. The other block of townships was in Placer and Nevada counties. These areas relied on the expanding but destructive hydraulic mining industry as a major economic support. Some hydraulicking townships did show an increase in farming, but these increases occurred in large townships with discrete farming areas. The fastest growing area was along the western edge of the three northern counties adjacent to the Central Valley. Amador County, with a higher base population in agriculture in 1860, grew more slowly.

The number of dependents on farming increased even more rapidly, exceeding not only the percent increase in agricultural workers, but also that of dependents on mining. Table 6-7 shows that this increase was due to a 111 percent increase in non-working agricultural dependents. This compares to the modest 39.1 percent growth of workers. Unemployed dependents characterized the agricultural sector and reflected its spatial stability, greater time and human energy investments, and prevalence of families. The relatively high dependent to work ratio is shown by comparison to other occupational sectors (Table 6-8). As in the case of mining, this ratio was largest in the areas around major population and amenity centers. The townships containing Dutch Flat, Auburn, Grass Valley, Nevada City, Jackson,
### TABLE 6-7: PERCENT INCREASE OF AGRICULTURAL DEPENDENTS

<table>
<thead>
<tr>
<th></th>
<th>1860</th>
<th>1870</th>
<th>1880</th>
<th>Percent Increase 1860-1880</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers</td>
<td>2757</td>
<td>3284</td>
<td>3836</td>
<td>39.1</td>
</tr>
<tr>
<td>Non-Workers</td>
<td>2473</td>
<td>3996</td>
<td>5219</td>
<td>111.0</td>
</tr>
<tr>
<td>Total Dependents</td>
<td>5230</td>
<td>7280</td>
<td>9055</td>
<td>73.1</td>
</tr>
</tbody>
</table>

### TABLE 6-8: DEPENDENT TO WORKER RATIO BY DATE AND OCCUPATION

<table>
<thead>
<tr>
<th></th>
<th>1860</th>
<th>1870</th>
<th>1880</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>1.90</td>
<td>2.22</td>
<td>2.36</td>
</tr>
<tr>
<td>Mining</td>
<td>1.32</td>
<td>1.68</td>
<td>1.91</td>
</tr>
<tr>
<td>Labor</td>
<td>1.10</td>
<td>1.55</td>
<td>1.51</td>
</tr>
<tr>
<td>Transport</td>
<td>1.31</td>
<td>2.09</td>
<td>2.07</td>
</tr>
<tr>
<td>Lumbering</td>
<td>1.63</td>
<td>1.65</td>
<td>2.09</td>
</tr>
<tr>
<td>Other</td>
<td>1.33</td>
<td>1.86</td>
<td>1.96</td>
</tr>
</tbody>
</table>
and Sutter Creek were well above the regional average.

The ethnic composition of the agricultural sector remained more American than was the case in mining, though foreign born workers increased in importance through time. American farmers born outside California outnumbered foreign born workers two to one in 1860. The ratio was approximately one to one by 1880. Three patterns characterized the agriculturally employed group, (1) the spatial pattern of foreign born groups in farming, (2) the difference between those listed as farmers and those listed as gardeners, and (3) the regional prevalence of North-born Americans rather than Southerners. The leading ethnic groups among foreign born agricultural workers in the Central Mines were Germans, Irish, and Chinese. Their distribution varied widely, however. The three leading ethnic groups and percent of the total agriculture work force for each county are:

- Amador County: German 9.9, Italian 8.3, Irish 4.7
- El Dorado County: German 14.1, British 6.5, Irish 5.9
- Nevada County: Irish 11.1, Chinese 11.1, British 9.1
- Placer County: Chinese 16.6, German 8.5, British 6.7

In view of the discrimination to which the Chinese were subjected, it is interesting that they formed one of the largest ethnic groups in agriculture. This is explained by a closer observation of the manuscript census data. In most
cases, the Chinese were listed as gardeners. Most grew their products on mineral claims or near Chinese mining zones and supplied local, primarily Chinese, markets. Those Chinese not listed as gardeners were invariably farm laborers, working on someone else's land. Many Italians in Amador County also worked as gardeners or farm laborers. By contrast, landowning farmers were generally American, German, or British.

One feature of the American agricultural population, in addition to numerical superiority, was the prevalence of Northern versus Southern born settlers. Ten percent of farm workers were born south of Pennsylvania and the Ohio River and east of Missouri, Oklahoma, and Texas in 1880. More than half of them hailed from Kentucky and Tennessee. A further seven or eight percent came from the frontier states of Texas and Missouri. This characteristic remained constant throughout the post-gold rush era of adjustment and extended to other occupational classes as well.

**Laborers**

Individuals classified as laborers are an unknown factor in devising this comparative occupational breakdown. Aside from the fact that laborers are most likely to be those holding multiple occupations, they probably include men who should have been included with miners, farmers, or some other class. For the region, there was a large
decrease in the number of laborers, followed by an equally large increase from 1870 to 1880 (Table 6-6). As great as this fluctuation was, it paled by comparison to those of some of the townships. Some increased nearly 1500 percent at the same time others fell by more than 95 percent (Table 6-9).

**TABLE 6-9: Number of Laborers**

<table>
<thead>
<tr>
<th>Township</th>
<th>1860</th>
<th>1870</th>
<th>1880</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amador 4</td>
<td>19</td>
<td>272</td>
<td>125</td>
</tr>
<tr>
<td>Kelsey</td>
<td>196</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Mud Springs</td>
<td>98</td>
<td>13</td>
<td>115</td>
</tr>
<tr>
<td>Bridgeport</td>
<td>139</td>
<td>18</td>
<td>123</td>
</tr>
<tr>
<td>Eureka</td>
<td>111</td>
<td>220</td>
<td>51</td>
</tr>
<tr>
<td>Placer 4</td>
<td>141</td>
<td>37</td>
<td>488</td>
</tr>
</tbody>
</table>

Possible explanations for these fluctuations include changes in road and railroad construction, general economic decline, and multiplicity of occupations. The most likely source of these questionable statistics, however, was the whim and attention to detail of individual census takers. Where workers were listed as farm laborers or railroad laborers, they are classed with agriculture and transport respectively. If a census taker did not bother to so designate a farm helper or track layer, but simply scrawled "laborer", then it inflated this nebulous category.

Laborers made up less than seven percent of the workers in 1860 and 1870 and approximately eleven percent in 1880.
As such they do not significantly affect the overall regional classification. They were important, though, in some townships. Laborers consistently concentrated in Amador 1, Amador 3, Placerville, Grass Valley and Nevada. Four of these townships contained the largest towns in the region. Townships containing Sutter Creek, Dutch Flat, and Auburn also showed higher ratios of laborers to total workers than other townships though the statistics are more erratic. The number of dependents and their ratio to workers for this class were the lowest of any occupational group. Americans and foreign born were evenly proportioned among laborers.

**Transport Workers and Lumberers**

Both of these industries increased employees substantially through the two decades, but neither ever became significant. The number of transport workers, including teamsters, road builders, and railroad employees, increased 27.4 percent to slightly over 1100 workers in the study area by 1880 (Table 6-6). Placer townships 2, 3, and 4, along the Central Pacific Railroad, and in the big quartz and population centers of Grass Valley and Nevada contained 638 of them. Placerville led all townships earlier, accounting for one in every five transport workers. With the damaging competitive blow of the Central Pacific and subsequent decline of the Placerville Wagon Road, this township
declined from 183 workers to a mere 46 by 1880.

Lumbermen located where the area provided adequate resources. Amador 3, Little York, Nevada, and Placer 4 employed nearly 58 percent of this work force. Placer 4 in particular mixed a ready resource with a constant demand for the railroad and the mining flumes leading to Gold Run and Dutch Flat. Lumberers had been more numerous in the mid-1860s, but curtailment of railroad construction cut employment. Nevertheless, the number of timbermen and wood-cutters grew by 28 percent from 1860 to 1880.

Dependent to worker ratios for lumbering and transport sectors were similar. Both were higher than those of mining, laboring, and services, but fell short of agriculture (Table 6-8). By the 1880 census, both industries accounted for only 3450 dependents, 6.5 percent of the total population of the Central Mines. The reasons behind the high dependent to worker ratios are unclear. One possible cause, though, might have been the ability of teamsters and amateur wood-cutters, to live in towns and travel to their jobs. Evidence on other occupational sectors has continuously shown that the occurrence of non-working dependents was much higher in urban areas.

Americans and, later, Americans and California-born, dominated the transport industry. A high number of California-born among transport workers resulted from the frequency of teamster families where a wagon owner enlisted several sons, as well as an occasional brother
or two, to help in the business. Americans and Californians accounted for 75.4 percent of the transport workers in 1860 and 69.5 percent in 1880. Chinese outnumbered all other groups in transport in the years between 1860 and 1870, owing to the railroad. One estimate placed the number of Chinese railroad laborers at 10,000 (Chiu 1963; 48). However, they had followed railroad construction out of the area and were not recorded in 1870.

Chinese, employed as wood cutters and charcoal burners for mines and railroads, numbered one-fourth of all lumber workers by 1880. The remaining 75 percent included roughly equal numbers of American and foreign-born from areas where woodcutting and lumberjacking were a way of life. Most non-Chinese, foreign-born lumbermen were Canadian, German, and Scandinavian. Americans hailed mainly from New England, particularly Maine, and the Great Lakes states.

Other Employed Males

The final category in this survey includes all males employed in secondary and tertiary occupations excluding those in transport or labor. This category most closely reflected changes in total population. Mining, agriculture and lumbering drew on landed resources while transport and labor had close ties to primary industries and external links. This occupational class was dominated by local services to people and their possessions.
From 1860 to 1870 the number of other employed males declined 34.9 percent. The ensuing decade, with increased non-working dependents for all occupational classes, provided a greater population base for services to draw upon. Thus, the number of workers in this category increased slightly (Table 6-6). The spatial pattern of change from 1860 to 1880 reflected total population changes (Map 6-4). Townships with rapidly expanding quartz or hydraulic mining industries and those along the railroad increased dramatically. On the other hand, most of El Dorado County and the upper elevation placering areas of Nevada and Placer counties lost more than 60 percent of these workers.

This sector of the work force also clustered in the service centers of greatest market and size (Table 6-10). The percent of other employed males of the total work force and the total population, derived from figures for all townships and all three census years, indicate the close relationship of high population and a high proportion of service workers. This was particularly true of those areal units containing large towns. The townships in which Auburn, Placerville, Dutch Flat, Grass Valley, and Nevada City were located, contained 49 percent of these service workers in 1880 while only 39 percent of the total population resided there.
MAP 6-4: PERCENT CHANGE IN OTHER EMPLOYED MALES 1860-1880
(BY TOWNSHIP)
TABLE 6-10: Others as a Percent of Workers and Population

<table>
<thead>
<tr>
<th>Township Population</th>
<th>Other Employed Males as a Percent of Total Population</th>
<th>Other Employed Males as a Percent of Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2499</td>
<td>28.3</td>
<td>15.9</td>
</tr>
<tr>
<td>2000-2499</td>
<td>21.6</td>
<td>12.4</td>
</tr>
<tr>
<td>1500-1999</td>
<td>19.4</td>
<td>11.3</td>
</tr>
<tr>
<td>1000-1499</td>
<td>19.3</td>
<td>11.7</td>
</tr>
<tr>
<td>500-999</td>
<td>13.9</td>
<td>8.3</td>
</tr>
<tr>
<td>500</td>
<td>8.2</td>
<td>5.5</td>
</tr>
</tbody>
</table>

The number of non-working dependents on this class increased substantially during the two decades offsetting worker emigration. Once again, those townships with major towns were above the regional average in dependent to worker ratio. Total dependents on these services, including workers and unemployed, numbered 11,835 in 1860 and 11,790 in 1880. This category of services, bolstered by a few secondary occupations, maintained support of one-fifth of the region's residents.

The ethnic pattern for service employees was both consistent and diverse. Americans and foreign born were numerically equal in 1860 and maintained that equality twenty years later. Among foreigners, British, Germans, and Chinese each numbered about ten percent of all workers in 1880, while the Irish and Italians accounted for another nine percent. Various foreign groups tended to locate in areas where their compatriots in other occupations settled. Amador County contained nearly all the Italians.
British were well represented in Grass Valley and Sutter Creek, and Chinese were proportionately distributed according to their mining ranks.

Several interesting ethnic patterns were associated with specific service occupations. A five percent sample of the workers in this category revealed the following conclusions:

1. At least half the blacksmiths were born in Canada.
2. Most foreign born store owners were German or Chinese.
3. Most Chinese were store owners, cooks, or laundymen.
4. Most saloons were owned and operated by Irish or Germans.
5. There was no specific pattern for the British or Italians.
6. There were few foreign born workers in legal and government jobs.

None of these conclusions is particularly startling or unusual. Each gives insight to cultural patterns and comparative experience on the American frontier and furnishes topics for historical cultural geographers to investigate.

**Comparisons and Conclusions**

The purpose of this chapter was to determine the changes
in occupational profile and its spatial and demographic character that resulted from the emigration and partial replacement of workers and residents. There were substantial differences in the fates of the occupational classes (Table 6-11).

Comparison of the proportions of dependents for each occupational class readily shows the great decline of mining. Analysis presented in Chapter Five showed that the number of employed males declined by 41.2 percent from 1860 to 1880. This extrapolates to a numerical drop of 17,611 workers. Of these, some 16,072 or 91.3 percent, can be accounted for by the decrease in miners. This illustrates clearly how keenly the various detrimental influences on placer mining were felt.

Despite this fact, mining still led all categories in support of both workers and total dependents in 1880. Thirty-two years after James Marshall plucked a few bits of gold from a lumber mill tailrace, gold mining accounted for some 43 percent of the population directly and perhaps another 20 to 30 percent indirectly through its demand for transport, lumber, labor, and services. At this time the apellation "Gold Country" was still more than an historical reference.

Mining was the leading employer in 22 of 30 townships in 1880 (Map 6-5). These 22 census units accounted for 71.2 percent of the total population. Mining continued to be the
<table>
<thead>
<tr>
<th>Class of Occupation</th>
<th>1860 Percent Of Workers</th>
<th>1860 Percent Of Dependents</th>
<th>1870 Percent Of Workers</th>
<th>1870 Percent Of Dependents</th>
<th>1880 Percent Of Workers</th>
<th>1880 Percent Of Dependents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>63.0</td>
<td>59.9</td>
<td>49.5</td>
<td>43.9</td>
<td>43.3</td>
<td>39.4</td>
</tr>
<tr>
<td>Agriculture</td>
<td>6.4</td>
<td>8.8</td>
<td>13.5</td>
<td>15.8</td>
<td>15.3</td>
<td>17.1</td>
</tr>
<tr>
<td>Labor</td>
<td>6.6</td>
<td>5.3</td>
<td>6.5</td>
<td>5.3</td>
<td>11.0</td>
<td>7.9</td>
</tr>
<tr>
<td>Transport</td>
<td>2.0</td>
<td>1.9</td>
<td>4.0</td>
<td>4.5</td>
<td>4.4</td>
<td>4.4</td>
</tr>
<tr>
<td>Lumber</td>
<td>1.0</td>
<td>1.2</td>
<td>2.8</td>
<td>2.5</td>
<td>2.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Other Workers</td>
<td>20.9</td>
<td>20.0</td>
<td>23.7</td>
<td>23.3</td>
<td>23.9</td>
<td>22.3</td>
</tr>
<tr>
<td>Undetermined</td>
<td>2.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.7</td>
</tr>
</tbody>
</table>
MAP 6-5: MINERS AS A PERCENT OF ALL EMPLOYED MALES 1880
(BY TOWNSHIP)

M = mining the largest employer
(by percent of total workers)
dominant employer in those areas where it underwent the most serious declines, such as El Dorado County. This demonstrates forcefully the tremendous continuing reliance on mining as a population support over much of this man-land system. There was simply no other resource sufficient to support more than a few scattered settlers. As hard and as far as these township populations fell, those residents remaining or their replacements still depended largely on gold for their livelihood.

Mining was surprisingly important as an employer in those townships generally regarded as agricultural, it was the major occupation in Placer 2 and Salmon Falls, and fell just short of agriculture in Rough and Ready, Placer 9, and Ione. These areas, with the exception of a few small quartz operations contained only copper, placer gold, and some marble and limestone. The mining was small-scale and in many cases still an individual pursuit. In all townships except Placer 4, at least one in five workers was a miner. This omnipotence again demonstrates the strength of the industry.

Finally, Table 5-3 (p. 205) showed the great variation in population changes that befell the thirty census townships in the region. Eight increased, while another four declined by less than ten percent. Of those twelve reasonably successful units, eight were dominated by mining--five by quartz mining (Amador 4, Amador 1, Grass Valley, Nevada, and Placer 2) and three by hydraulicking (Washington,
Bloomfield, and Little York). Another, Rough and Ready, employed 43 percent miners, a figure barely exceeded by farmers. Only the three units through which the Central Pacific Railroad passed were able to grow without large scale alternate mining developments.

Other occupations were limited, reflecting their recent and inchoate developments as independent industries. Agriculture increased the most, but even with its high dependent to worker ratio, it only accounted for some 17 percent of the population in 1880. Its influence was concentrated along the western flank of the region from Rough and Ready to Ione townships. Transport and lumbering doubled their tiny shares of the population with the former concentrating along the railroad and, to a limited extent the Placerville Wagon Road. The proportion of other workers remained secondary and consistent, reflecting its close relationship to the total population level and the continuation of this region as one of small urban places and a dominance of primary economic functions.

The most significant geographical pattern was the clustering of all these occupations around the larger towns. Labor and other services were heavily concentrated there, and even transport and the primary industries showed tendencies to locate near or in towns. For each occupational class the dependent to worker ratio increased in areas containing larger towns further concentrating the
population. In the last chapter, the presence of amenities was dismissed as a factor in migration to the Central Mines region. However, once in the region, often now with family, the new worker naturally searched for amenity areas to the limit of his occupational ability.

Also in Chapter Five, it was demonstrated that the ethnic pattern for the population changed over the period from 1860 to 1880, but the ratio of foreign born to non-California American born remained stable. These data mask considerable occupational variation, as reported in this chapter. Table 6-12 and 6-13 present birthplace-occupation matrices for 1860 and 1880. Each box contains a percentage figure of the total male work force represented by that ethnic-occupation cross-section. While the ratio for the entire work force was 1.51 foreign born for every American in 1860 and 1.55 in 1880, the ratio for miners increased from 2.2 to nearly three to one during the same period.

Other occupational classes also varied, with the exception of the service category. True to its pattern, services remained fairly stable in foreign born in non-California American born as well. The most important changes during the two decades for the ethnic character of the region were the rapid relative decrease of American miners, the relative rise of foreign farmers and farm workers, and the natural increase of California born in all
TABLE 6-12: ETHNIC-OCCUPATION MATRIX FOR 1860 (PERCENT)

<table>
<thead>
<tr>
<th>Birthplace</th>
<th>U.S.*</th>
<th>Calif.</th>
<th>Foreign</th>
<th>Britain</th>
<th>Ireland</th>
<th>Germany</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>19.4</td>
<td>0.1</td>
<td>43.6</td>
<td>9.0</td>
<td>6.4</td>
<td>4.3</td>
<td>17.7</td>
</tr>
<tr>
<td>Agriculture</td>
<td>4.0</td>
<td>0.1</td>
<td>2.4</td>
<td>0.5</td>
<td>0.5</td>
<td>0.6</td>
<td>0.2</td>
</tr>
<tr>
<td>Labor</td>
<td>3.2</td>
<td>0.1</td>
<td>3.3</td>
<td>0.3</td>
<td>0.7</td>
<td>0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>Transport</td>
<td>1.5</td>
<td>---</td>
<td>0.5</td>
<td>0.1</td>
<td>0.1</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>Lumber</td>
<td>0.7</td>
<td>---</td>
<td>0.3</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>Other</td>
<td>10.9</td>
<td>0.1</td>
<td>9.8</td>
<td>1.5</td>
<td>1.4</td>
<td>2.6</td>
<td>2.5</td>
</tr>
<tr>
<td>Total</td>
<td>39.7</td>
<td>+ 0.3</td>
<td>+ 60.0</td>
<td>=</td>
<td>100 Percent</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Excluding California

TABLE 6-13. ETHNIC-OCCUPATION MATRIX FOR 1880 (PERCENT)

<table>
<thead>
<tr>
<th>Birthplace</th>
<th>U.S.*</th>
<th>Calif.</th>
<th>Foreign</th>
<th>Britain</th>
<th>Ireland</th>
<th>Germany</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>10.4</td>
<td>2.9</td>
<td>30.0</td>
<td>8.3</td>
<td>3.2</td>
<td>2.9</td>
<td>11.1</td>
</tr>
<tr>
<td>Agriculture</td>
<td>7.0</td>
<td>2.1</td>
<td>6.1</td>
<td>1.0</td>
<td>1.0</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Labor</td>
<td>3.8</td>
<td>2.1</td>
<td>5.1</td>
<td>0.4</td>
<td>0.9</td>
<td>0.8</td>
<td>2.2</td>
</tr>
<tr>
<td>Transport</td>
<td>2.1</td>
<td>1.0</td>
<td>1.3</td>
<td>0.2</td>
<td>0.3</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>Lumber</td>
<td>1.0</td>
<td>0.1</td>
<td>1.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.5</td>
</tr>
<tr>
<td>Other</td>
<td>10.7</td>
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<td>10.6</td>
<td>2.5</td>
<td>1.0</td>
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<tr>
<td>Total</td>
<td>35.0</td>
<td>+ 10.8</td>
<td>+ 54.2</td>
<td>=</td>
<td>100 Percent</td>
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</table>

*Excluding California
occupational classes.

The Central Mines region remained more occupationally skewed than the larger regional units of which it was a part. Mining in the region continued to play a role far in excess of the state, the West, of the nation (Table 6-14). In view of the considerable mining taking place in Nevada, Colorado, Arizona, Utah, Oregon, Idaho, and Montana during those two decades, its unusual dominance in the Central Mines is clearly illustrated.

Agriculture gained in the study area, but still trailed all three larger regions by significant amounts, particularly the nation as a whole. Also, the service sector was comparatively low in the Central Mines. Apparently, the primary economies that dominated the Central Mines continued to require far fewer service personnel in the remainder of the country. This relationship needs analysis itself in some future study.

In the introduction to this chapter the question was posed—"Why did these people come to the region?" The answers were many. Some came to farm the small valleys and flats on the edge of the foothills. Some came to work the new railroad or carry goods to Nevada by wagon. Some owned businesses and provided services to their neighbors and to visitors. The biggest number, though came as they always had, to mine the gold that made the region's man-land system a reality.
<table>
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<th>Category</th>
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<th>El Dorado</th>
<th>Nevada</th>
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CHAPTER 7

THE EVOLUTION OF SETTLEMENT, 1860 TO 1880

Mining evolved from 1859 to 1880 toward a set of technologically advanced but geographically limited forms. Other methods of land use also adjusted, with some like agriculture, expanding dramatically. The population of 1859 was nearly replaced in two decades by a new set of residents pursuing new goals. Each change in the system altered the geography of the region. Among the most important of those new geographical patterns was settlement. Towns founded during the early days of placer gold exploitation had been located on the criterion of geology. In adapting to this unusual resource basis, this town distribution, morphology, and attendant road network had followed few of the spatial principles common to tertiary economic centers. Instead, a large number of convoluted and ephemeral camps concentrated the population along river bars, flats, and ridgesides. By 1880, more farmers, quartz miners, women and children had concentrated people into fewer towns. But, the decline in the total population and the fall of placering meant fewer towns could survive, particularly the hitherto ephemeral placer camps.

Factors in Settlement Change

Contemporary and modern sources suggest a number of factors that contributed to these changes in Central Mines
settlement patterns. Some were familiar to all American frontier regions, while others were peculiar to mining areas. Each population center responded to a similar but unique combination of these stimuli. Towns survived and even flourished where conditions were favorable. Where unfavorable, they declined. The most extreme reaction was cessation of function and existence—the ghost town. Four categories of factors affected settlement. Each spelled success or doom for some of the little towns in the Sierra Nevada foothills.

The Role of the Mining Industry

The foremost factor in town survival, playing a direct or indirect role in the fate of every town, was the mining industry. Four adjustments in settlement are associated with the varied adaptations of the mining industry. Most common was the decline and disappearance of a town due to the virtual cessation of placering. As noted in Chapter Six, the absolute decline of miners, due to problems in placer mining, was enormous. Without a backup functional role, these camps and towns were essentially doomed. The fate of Orleans is a good example.

On the edge of montane Nevada County, Orleans (or Orleans Flat) was the leader of a cluster of higher elevation (4000 feet approximately) placer towns that included Wolsey Flat, Moore's Flat, and Snow Point. Miners dis-
covered significant placer deposits in the region in 1851, and hastily founded Orleans and the other towns. Together, they quickly swelled to a population totalling in the thousands. The gold claims at Orleans were shallowest, hence this town developed first. However, these shallow resources were exhausted first as well. By 1858, it began to lose ground to Moore's Flat. Bean (1867; 402) reported it largely deserted in 1867, a place where "a few Mexicans and Chinamen make a precarious living in working around abandoned claims." The fate of the shallow placers heralded the fate of the town itself. A scant five years after it was recognized as the leading community in Eureka Township, a cryptic note in an 1863 newspaper reported, "Orleans is now down to a half a dozen houses and some of those empty. Fire has destroyed much of the town, and Washoe silver competition has accomplished the rest" (Bancroft 1880b; Vol. 2, 813).

Towns with rich quartz deposits experienced very different fates. Centers such as Grass Valley and Sutter Creek missed the placer boom only briefly. The new industry was more stable and supportive of balanced, long term economic development and prosperity. Jackson, the county seat of Amador County, serves as an excellent example of such a town. It was founded shortly after the big flood of miners began pouring into the foothills from around the world. It prospered as a placer and trade center, garnered the county seat, and fortunes boded well for the residents.
The future was assured when early efforts at quartz mining showed that Jackson lay astride one of the richest portions of the Mother Lode. In addition to its resources, Jackson enjoyed a reputation for beauty and salubrity that made it a popular stop for travelers and journalists.

In August, 1886, a calamitous fire broke out and spread from one end of the town to the other. In barely three hours, the town was, with the exception of a few brick buildings downtown, destroyed, leaving more than 200 homeless and resulting in more than 350,000 dollars damage (Mason 1881; 174-175). This sort of disaster had spelled doom for many other towns both in the Central Mines and elsewhere on the frontier. Such was the financial and resource strength of the town, however, that less than three years later a correspondent to the Mining and Scientific Press (1865; 73) reported:

The town of Jackson is one of the most beautiful in the mountains. The business portion of the town is 'substantially and compactly built, and bears evidence of thrift and prosperity.' This is 'wonderful' when recollected that the whole town was destroyed by fire three years ago.

Jackson made the transition from a placer camp easily and not only prospered but weathered this fire and several other disastrous setbacks. With its population and pro-
sperity sustained by the local quartz mines, Jackson became one of very few California towns that continuously occupied a place as a leading gold mining center from its founding until well into the twentieth century.

Hydraulic mining also meant renewed industry for the towns around and upon gold bearing ridges. Hydraulickers, drift miners, and those engaged in re-sluicing the hydraulic tailings, along with their dependents and supporting personnel, swelled the camps and towns. One of the most famous hydraulic mining towns, near the huge Malakoff Diggings, was North Bloomfield. It was situated on the ridge between the middle and south forks of the Yuba River at an elevation of 3300 feet. Miners found gold as early as 1852, but the town did not appear until 1855. A year later it boasted more than four hundred people, and by 1860 connections with the California Stage Company further benefitted the town. Decline began in 1863, however, and by 1865 North Bloomfield was nearly depopulated, its demise appearing certain. Two years later, the North Bloomfield Hydraulic Mining opened operations. The Tertiary gravels were so rich, the availability of water so assured, and the transport and water supply systems sufficient to return excellent profits. The town, with its adjacent Malakoff camp, grew rapidly reaching a new high of 1200 people by 1880 (Wells 1880; 59-61). Hydraulicking thus saved a town that had nearly died with placer mining.
Hydraulicking did have one unusual side effect, however. Towns situated along the ridges containing auriferous deposits occasionally found themselves in the path of the insatiable, advancing hydraulic mines.

This usually forced the entire town to move, buildings, roads, and all.

Mining also led to clustering of people because of limited resources and in order to avoid expensive duplication of infrastructure. Three towns in Nevada County provide an example of this clustering plus the side-effects of hydraulicking. A series of rich strikes in 1852 along the ridges north of the Bear River in Little York Township led to the establishment of several towns. Three of them, Red Dog, Walloupa, and You Bet, prospered and became important centers in the region by the mid-1850s. Under the onerous pressure of declining placer gold, repeated fires, and site destruction by hydraulicking, none survived on their original sites.

Walloupa, although abandoned after only a few months in 1852, was optimistically rebuilt in 1855. But, miners found the ridge on which it rested to be less profitable than that beneath You Bet. As a result, virtually the entire population had moved across the canyon to the latter by 1860. Red Dog lasted sixteen years, but its ultimate fate was the same. As late as 1866, it contained more than 200 people and had survived two fires that burned it to the
ground in 1859 and 1862. But, exhaustion of the local mines spelled the end for the community and by 1869 it was a ghost town.

The most successful town in the region was You Bet. It started modestly as a small center for recreation and trade, and survived a variety of setbacks. Hydraulicking washed away the ground upon which it lay and forced a move of the entire town in 1857. In 1860, it absorbed nearly all of Walloupa, and in 1864, boasted some forty or fifty buildings. Fire destroyed the town in early 1869, but with addition of buildings and populace from Red Dog, the town was completely and hastily rebuilt. In 1872, the town was moved again, approximately one mile, to free the old site for hydraulic mining, and in 1873 the entire new town burned to the ground. Rebuilt immediately, it continued into the 1880s supplying the labor and provisions necessary for the mines and mills in this rugged hill country. Thus, of the three towns that began with all the hopes and ambitions of any other frontier town, only one functioned in 1880. As gold dwindled and corporate mines gobbled up the claims along Arkansas Hill, Squirrel Hill, Chalk Bluff, and the other ridges, the population clustered where success seemed to lie—even if it did have to move twice and be rebuilt from ashes an equal number of times (Ibid.; 70-73).
The Role of Other Economic and Political Functions

Economic activities other than gold mining allowed the survival of a few towns and led to the creation of a few new ones. Ione prospered, Rough and Ready survived, and several towns in western Placer County were founded to function as agricultural service centers. The role of political center aided the towns of Nevada City, Auburn, Placerville, and Jackson. Auburn faced imminent demise according to most contemporary observers, after suffering a trio of destructive fires and a virtual depletion of placer gold. Even the decision to route the Central Pacific Railroad through the town appeared insufficient to save the town. However, the town lingered on, refusing to lapse into the final decline. What kept the town alive, according to contemporaries, was its function as the seat of local government. One correspondent wrote:

The people here are now clinging to a straw—to the idea that the Pacific Railroad will drag the town from its present sinking condition. --Possibly it may live on a few years, but from 'indications' not to be mistaken, Auburn will never by what is has been; there is not outside trade upon which it can rely for support, it being the County Seat is now the main 'standby.' Should it 'in the course of human events' happen that the County Seat be moved from here--which is by no
means impossible--the result would be that Auburn would sink into nothingness. The people here seem to be totally indifferent as to the future, and only care for the present (Bancroft 1880b; Vol. 3, 847).

Auburn survived and prospered as the years passed. It owes much to its early role as the county seat. This role demanded employment of county officials locally, required location of certain county facilities such as jails, hospitals, and lent prestige that attracted businesses and residents.

**The Role of Transport Links**

Availability of infrastructure affected many towns. Placer camps, littered along streams and rivers and across flats and ravines, were founded on the basis of geology. Numerous and ephemeral in many cases, their supply was undertaken by mule train when no wagon trail existed. Therefore, though a reasonably complete system of wagon roads existed by 1859, it came nowhere near connecting all the camps and towns in the foothills region. When emigration and declining resources began to affect the region, the towns on the transport links stood inherently better changes of survival as supply nodes.

The importance of transport routes could change, mainly owing to competition from other routes. The fates of many
towns depended on this factor or on the combination of infrastructural strength and mining. Latrobe, in El Dorado County, was established as a railroad depot. Links with Amador County, with Placerville, and with Nevada via the Placerville Wagon Road, allowed the small terminus to grow rapidly to 800 people. Two events doomed Latrobe, however, as quickly and surely as if it had depended on exhausted mines. First and most damaging, the Central Pacific Railroad usurped El Dorado County's role of supplier to the Comstock mines. A more serious blow occurred a few years later when the Sacramento and Placerville Railroad extended its line eleven miles inland to Shingle Springs. Even the Amador County trade was eventually lost to wagon roads and a competitive railroad farther south. By 1873, Latrobe business was depressed and the town nearly abandoned with a population of fewer than 80. One store and one hotel served as reminders of the brief prosperity that came and went with the railroad traffic (Sioli 1883; 199).

The antithesis of Latrobe was the successful Central Pacific town of Colfax. The town was laid out in 1865 on the site of an earlier mining camp when the rails reached the location eighteen miles northeast of Auburn. The people of the old gold camp of Illinoistown, a half mile distant, promptly moved to the new rail town. Colfax grew steadily and seemed to lead a charmed existence. Rich quartz veins
were discovered nearby in 1866. Completion of a narrow gauge railroad from Colfax to the mining centers of Grass Valley and Nevada City a decade later further entrenched the town as the leading rail and supply center between Auburn and the Nevada border. The town easily overcame a fire in 1874 that destroyed virtually the entire business section of the town, and in 1880 it contained numerous businesses, a major rail yard, and more than 600 people. Colfax continued to prosper and, even when its mines subsequently declined, it clung tenaciously and successfully to the lifeline that was the transcontinental railroad (Lardner 1924; 679). As mining camps around them died, the transport towns continued to maximize available opportunities and carve an existence, sometimes precarious, from the faltering economic zone that was the Sierra Nevada mining country.

The Role of Fire

One final factor worth mentioning was fire. The spectre of fire haunted these wooden shanty towns for decades, repeatedly roaring through first one town, then another, reducing them to charred lots and beleaguered citizens. Nearly every town suffered a major destructive fire resulting in the almost total erasure of a settlement. A few, like North Bloomfield, led charmed lives, but these were exceptions. Most of the largest and most successful
towns, suffered repeated fires through the 1850s and 1860s. Even when a town was prosperous and well built, with numerous brick and stone commercial structures, the residential areas all too often remained dominated by wood-frame shacks and houses, susceptible to the slightest outbreak of fire. This was especially true in the hot, dry summer months when the fire climax chaparral and oak woodland vegetation was extremely fire prone. It took ambition, hope, and money to rebuild a town after this sort of setback. If other conditions were not favorable, then some people just could not come up with those three ingredients.

**Analysis of Settlement Pattern Changes, 1860-1880**

Several patterns of change can be hypothesized for the settlement of the Central Mines based on the above factors. A decrease in towns, concentration around more limited resource sites and transport links, and the disappearance of placer sites are the most logical and predictable. Unfortunately, for a subject so stimulating to the imagination, to fiction, to the romantic, and to the landscape relic seeker, it is a barren one for hard research data. Population figures, or even estimates, for the various settlement nodes are limited to the half dozen or so larger, incorporated towns and to one fairly reliable census report for 1880. Due to this paucity of reliable figures, proxy
data in the form of voter registration figures were used in a formula to derive a town size classification system.

For purposes of settlement distribution analysis and hypothesis testing, three maps have been prepared. Map 7-1 shows the towns and camps portrayed on a Work Progress Administration map for the 1850s. No size classification is possible but it suffices to show the number and distribution of population nodes. Map 7-2 shows the settlement pattern circa 1867 and is based on a map by Hoffman (1865) voter registration records, and other data formulated in the manner explained in Appendix Two. Map 7-3 is based on the United States census report on unincorporated places (1880a; Vol. 1, 111-112) plus other sources of data for the year 1880. Each map was constructed to provide relatively reliable bases of data for comparison of settlement node distribution, size in the case of the latter two maps, and, indirectly, functional success. The size classifications used for Maps 7-2 and 7-3 are very broad and, while of consequent limited use, are quite reliable. These categories are less than 100 people, 101 to 500, 501 to 1000, and more than 1000.

Comparison of these three maps reveals three changes in the settlement pattern that transpired from the mid-1850s to 1880. The most obvious was a substantial decrease in the number of towns. There were 191 towns and camps including many clustered along the American and other
MAP 7-1: TOWNS OF THE CENTRAL MINES, CA. 1855

SEE APPENDIX 2 FOR IDENTIFICATION OF TOWNS
MAP 7-3: TOWNS OF THE CENTRAL MINES, 1880

- NEVADA CO.
- PLACER CO.
- ELDORADO CO.
- AMADOR CO.

Legend:
- >1000
- 501-1000
- 101-500
- 100 OR LESS
- WAGON ROAD

Scale: 0 5 10 15 20 miles
rivers. It is impossible to determine if this first map was meant to show concurrently extant towns in the 1850s, but other evidence suggests that this number of towns may be lower than the true one. In his exhaustive dictionary of California gold camps, Gudde (1975; 430-472) lists some 1520 places for the four counties under study. A handful of these were outside the study area but within the counties, or were founded after 1860. Of greater importance, many existed for only a few years during the 1850s. Nevertheless, this large number still suggests that a figure of nearly 200 coincident towns is not unreasonable.

The 1867 map shows by contrast only 114 towns while the 1880 map shows but 80. It is possible that a few small and unimportant places may have been missed on either or both these maps, but their omission would not affect the conclusion. The decline in the number of towns resulted from the decreased opportunities for miners to gather at widespread and easily accessible placer sites. As the resource base became geographically limited, so too did the settlements.

A general increase in size coincided with the decrease in the number of settlements. An approximation of the size increase was obtained by according each town a point value corresponding to its size classification, with four points being awarded the larger places and one point the smallest. The mean for 1867 settlements using this measurement was 1.79. The mean for 1880 was 2.09. This increase in the
size of surviving towns corroborates the evidence suggested in chapters five and six, that people clustered as resource availability declined and more concentrated forms of mining began to dominate.

Although towns decreased in number and increased in size, the expansion of agriculture contributed to a dispersal of some people to non-nucleated, rural settlement. The numerical increase of farms by 1880 supports this conclusion. In addition, figures quoted in Angel (1882; 411-412) show that by 1882, more than 20 percent of the people in the portion of Placer County under study here resided outside the thirty settlements and mines listed.

The third change was a slight redistribution of the remaining towns. In most places a simple consolidation of a number of places into one or a few larger towns occurred, as in the example of Walloupa, Red Dog, and You Bet. But, several noteworthy spatial shifts did take place. Western Nevada County lost all its towns as placer miners moved on to greater opportunity elsewhere. More important than the elimination of a few Nevada County centers, was the abandonment of the riverside camps (Map 7-1). Several dozen of these placer centers were absent by 1880. This again reflects the decline of placering, as does the disappearance of many towns on the western edges of the four counties. These lower elevation towns and camps were too numerous and proximate to survive as agricultural ser-
vice centers.

Most upper elevation camps survived, particularly in Placer and Nevada counties, as hydraulic mining surpassed expensive drift mining operations. Both the number and size of these towns increased from 1867 to 1880 as hydraulicking hit full stride.

Mining changes and agricultural progress were the principal factors in the numerical decline, increase in size, and change in spatial aspects of Central Mines towns. Locally, the most telling factor in the survival of certain towns over others was the presence of a major transport route (Map 7-3). Superimposed on the settlement pattern for 1880 is the network of wagon roads shown on an 1860 map of Central California (Elliott 1860). The close correlation of these roads and the extant towns in 1880, particularly the larger ones, illustrates the fact that availability of transport links to external markets and suppliers gave an enormous advantage to towns so fortunate.

The hypothesized changes did occur. Numerical decrease, concentration, and change in distribution transpired. The most important factor was placer decline as evident from the great decrease in towns and disappearance of centers with no alternate means of support. Position along major roads proved critical to many as the region adjusted to a role not as the goal of thousands but as a place aside from the major economic currents. The fundamental adapta-
tions in the land use and population sectors of this man-
land system wrought tremendous changes in the distribution
and relative size of the many gold camps of the Central
Mines.

Town Morphology

Amid the many changes in size and distribution of the
towns, one aspect of the settlement geography remained
largely unaltered--the morphology of the towns.

Early mining camps were curious affairs. Their chief
characteristics were almost the antithesis of the concept
of a town or settlement. They were disorganized and
ephemeral, filled with transients. The prevalence of tents
or rude wooden shacks as residences and even commercial
structures reflected this. In addition to impermanence, they
were scattered and haphazardly formed. Many of these towns
never escaped this peculiar look, either dying in a few
months or years, or persisting for several decades with
that appearance of confusion and impermanence. Hittell
writing in the 1874 edition of Resources of California
(p. 56) described mining towns as follows:

Most of them are built with crooked streets
through the middle of a canyon, which near the middle
is densely lined with stores, billiard rooms, liquor
shops, and restaurants. The dwellings are scattered
about irregularly: some are neatly built and are surrounded with pleasant gardens; the majority are miserable little shanties or log-cabins, with no yard, flowers, or fruit-trees to give an appearance of home. The population is not permanent. One year the people are here, next they are elsewhere.

The assemblage of structures making up a foothills town continued to exhibit an unusual adaptation to landforms in its layout. While the typical frontier town of the West was noted for regularity of grid pattern and the monotony of its geometric scheme, the mining towns provided interesting if somewhat bewildering exceptions (Figure 7-1) (Reps 1979; 195-237). The Placerville Mountain Democrat (1928; 26) reported the following on Hangtown (Placerville):

There is no design or plan in the location of a mining camp--it just happens. This was essentially true of Hangtown. No regard was paid to streets or alleys by the first squatters or miners, the contours of the hills and courses of the streams were the natural guides which governed in selecting camp sites. At first there was a scattered collection of tents which were supplanted by very rude cabins, and later by other buildings, all following the original idea, to front on the crooked Main Street,
Figure 7-1: The Town of Nevada City in 1856 showing adaptation to terrain and complex street pattern. Photo courtesy of the Nevada County Historical Society.
that followed Hangtown Creek.

When an opportunity to rebuild a town was presented to the residents, it was necessarily ignored, since the legal ramifications of any cadastral changes would have been considerable. Thus, after the conflagration that destroyed the entire town of Jackson in 1862, the city fathers and residents rebuilt the town along the same convoluted plan it had prior to the fire. This procedure reoccurred often in this and other mining regions, although some town populations attempted to straighten a main street or align a downtown area to a grid pattern.

Even the smallest of towns had multiple districts which included a business sector, a white residential sector, and a Chinese sector if they were present. The Chinese often found themselves alongside their mining operations—the tailings and placers of the streams around which the towns were originally formed. In Jackson this proved disastrous for them as a combination of heavy rains and denudation of vegetation resulted in a flash flood in 1878 that carried away virtually the entire Chinese sector.

This scattered, unconsolidated, and confused look was exacerbated if and when a town began to undergo significant functional change. The following quote from a perceptive correspondent to the San Francisco Bulletin (Bancroft 1880b; Vol. 3, 874) communicates not only the appearance and function of Ophir, in western Placer County, but also the nature
of these struggling population centers throughout the
region:

North of Newcastle and separated from it by a wooded
ridge, is the scattered town of Ophir. It seems as if
it might be christened into at least three towns for
one, riding down the gray slopes from the north, finds
first an old mine with silent wheels; a yellow current
filling a wide ditch; a sleepy sign over a sleepy
hotel; a few block roofs of houses. Then for a space
following the ridge there is vacuity, after which comes
an active mine, smoking and grumbling, and grinding
up quartz in its iron jaw. Long lines of red-shirted
men with tin buckets and stolid face go by to take
their 'shift' in the mine. The black windless creaks,
the yellow water falling over the wheel makes as many
rainbows as it it were pure as crystal. Near the mine
there are boarding houses of the cheap type for the
workmen, and saw-dusted saloons, with the road in
front well-sprinkled each morning, possibly with
sheds over the drinkways, and alluring signs. This
is the second fragment of Ophir. If one still descends
and follows an erratic ravine there will be in the
space of another quarter of a mile more houses, and
orchards, children playing in the hot dust, and whole
families out berry-gathering. This is the coming
Ophir, and the most interesting part thereof
is where the streets get tangled up between the blacksmith-shops, and old-fashioned boarded up wells. Even the newest of Ophir has a mossy and slightly bewildered look. The fact is, it cannot yet decide whether it is a mining town, or an orchard town, or a berry community. And when it knows it will lost its present dubious look.

The one thing that remained constant amid the many changes in land use, population, and settlement was the scattered and convoluted settlement form. Towns such as Nevada City (Map 7-4) still exhibit this pattern of twisted canyon and creekside morphology surrounded by dispersed buildings. The interesting and unusual shape of the mining towns, so distinctly contrasted with their agricultural and military counterparts, was one lasting legacy of the gold rush.

Conclusion

Many factors influenced the Central Mines settlement pattern during the two decades after the Comstock discovery. The most important factor was the evolution of mining and how well each town could adjust to the changes. The decline of placer deposits, and geographical limits on the quartz and hydraulic sources led to a concentration of people into fewer and larger towns. Places like Orleans, Walloupa, and Red Dog decayed or moved allowing others like
MAP 7-4  NEVADA CITY, CA. 1900

(AFTER: MAP SHOWING THE HARMONY CHANNEL, 1903)
You Bet to survive. Towns favorably located, such as Jackson and North Bloomfield, prospered and by 1880 faced an optimistic future.

Other factors also contributed to town survival. Agriculture demanded some service towns remain. Centers along major transport routes adapted more easily to the regional shift from focus to byway. Colfax and other Central Valley Railroad towns did particularly well. Even transport advantages could be fleeting, though, as the people of Latrobe learned.

As placer miners departed and the population resorted to agriculture, transport of supplies, and spatially limited methods of gold extraction, settlement change was profound. Of the scores of camps and towns that littered the ravines and flats, less than half, swollen by concentration and limited in distribution, survived. They were the heirs of an age and man-land system that could not continue. They owed their beginnings, their peculiar morphology, and, with a few exceptions, ultimately their existence to mining. But many siblings were lost along the way.

THE SYSTEM IN 1880

Three terms described the Central Mines system in the 1850s--focused, ephemeral, and homogeneous. Each represented one extreme of a continuum into which all frontiers,
indeed all settled areas, fit. The economy was largely monofunctional, the settlements short-lived and the population mobile. These conditions prevailed through virtually all of the study area.

A process of balancing along each continuum began with the resource and population changes from 1860 to 1880. Slowly the system initiated adjustments toward a more diverse economy, more permanent population and settlement patterns, and with adoption of new economic functions, a new geographical heterogeneity. Each of these balancing processes measured the remarkable changes affecting the local system.

By 1880, placer mining survived only among part-timers and the disadvantaged. However, while gold extraction had lost much of its numerical support, it still commanded a leading position in the Central Mines. Mining had employed over 90 percent of all men in the boom years. Although the percent had fallen to only 43 percent by 1880, mining was still the largest employer. New laws benefitted agriculture and lumbering, but also aided company mining because each depended on assured ownership and freedom from trespass.

Each of the former support functions had established the framework of independence by 1880. Transport and distant markets provided the means. But each, had only initiated the process. Agriculture in 1880 still showed a diverse
crop base and a dependence on local demand, but commercial production of wine and fruit characterized many farms in more accessible areas. Lumbering had fallen badly with the mining decline but Towle Brothers and a few other mills along the railroad sent wood to the Nevada mines and California cities. Transport services to the region's mining zones had evolved to a complex supply and demand network in which the Central Mines was a region of traverse as often as it was an objective.

Settlement reflected the changes. Scores of old placer camps disappeared, but a few railroad towns, agricultural centers, and new mining centers were added to the depleted network of mining towns. Roads pushed eastward and railroads followed in order to reach the Nevada mines or the farms of the Central Mines. Nevertheless, all but a few towns still depended heavily on mining for their population support.

Increasing functional diversity led to more permanent settlement and population patterns. The turnover rate in employed males dropped from nearly 99 percent to 76 percent. The rate was still high, but with more men working alternate economic functions, and far more families, the demographic pattern had drawn much closer to that of the state and the nation. Most of the towns in 1880 were survivors from a generation of numerous small camps. By processes of elimination and absorption, they had become more firmly established. External communications links entrenched some
while others clung precariously to new forms of mining and to supply of the inchoate alternate industries. Each town's passing was now an event of significance, no longer a commonplace characteristic.

The decreasing ephemeral quality of land use, settlement, and population and the increased diversity of economic activities marked the Central Mines with a growing geographical heterogeneity. El Dorado County, with poor quartz and hydraulic resources retreated badly in all respects. Placer County boomed anew with its combination of rich hydraulic mines in the east, strong commercial farming in the west, and the crucial rail artery throughout. Nevada and Amador counties clung tenaciously to their richer mining resources nearly ignoring other functions. The homogeneity of a mobile, placering economy was gone, replaced by a variety of responses based on resources, ethnic attitude, external decisions, and opportunity.

In 1880, the region still drew curious opportunity seekers, though fewer than during the gold rush. Some followed countrymen to deep quartz mines, some came to run the railroad, many to try a hand at farming in what promoters promised to be the farming region of greatest potential. No longer did thousands flock to the Central Mines to make an easy and quick fortune and return home to a better life.
The Central Mines region recovered slowly after the initial shock of placer mining decline and the population and settlement declines it engendered. Other forms of mining, a widening agricultural sector, and transport activities replaced it. In 1880, a more balanced man-land system, but one still dependent on gold mining, faced the remainder of the nineteenth century. A new set of adversities beset the region in the next twenty years. The 1880s opened with an adverse legal decision that led to further depression and decline in the region's leading industry. However, other land use functions continued to partially compensate. Quartz mining, the one remaining viable form of gold mining, continued to grow through the rest of the century. Agriculture expanded its production, based on external markets. The transport network improved, strengthening the external contacts for local lumbering and farming. The period 1860 to 1880 had been critical for determining new patterns of economic survival for the region. The next two decades firmly established those patterns in the old placering fields of the Central Mines.
Mining

The fate of mining still largely determined economic fortunes, population trends, and settlement patterns in the Central Mines region. Each form of mining met with varying levels of success. Placer mining continued to serve as a part-time activity for supplemental income for farmers and other workers. It also enjoyed a brief resurgence during the nationwide depression of the early 1890s. However, the latter was both short-lived and motivated by unusual hardship. Placer mining never recovered its original role due to paucity of resources. Mining for other minerals also remained small-scale due to limited ores. Tertiary mining and quartz mining continued to adapt and produce well. Their fortunes were very different, though, in the last two decades of the nineteenth century. One improved its technology and achieved ever greater returns, while the other virtually died due to its incredible success.

Tertiary Gravel Mining

The cessation of hydraulicking by court order in 1884 was easily the most significant event to affect the course of California mining after 1859. The success of this form of mining lay in its capacity to wash huge amounts of material cheaply in search of tiny fragments of gold.
Unfortunately for the industry, the debris was usually dumped in the nearest accessible river after sluicing. Sand, silt, cobbles, and other material coursed through narrow, rapidly flowing streams to be deposited wherever the current slowed for any reason. Out of the mountains it flowed, especially at high water periods, toward the rich orchards and wheat fields of the Central Valley. Choking the sluggish portions of the rivers along the flat valley floor, debris-filled water overflowed the shallow banks burying the lands and crops of nearby farmers under tons of mud and waste. As the amount of debris and frequency of inundation increased, farmers and Central Valley townspeople challenged the giant mining industry.

Protest over debris inundation began almost at the inception of its successful operations. Channels became choked during high water periods causing overflows not only onto nearby agricultural lands, but onto downstream mining claims as well (Figure 8-1). The Central Valley towns of Marysville and Yuba City, located at the junction of the Feather and Yuba Rivers, were subject to constant danger. These two rivers drained the richest ranges of Tertiary gravels, and by 1868 the beds of both rivers were higher than the streets of Marysville. The town spend hundreds of thousands of dollars in the next decade to construct levees, higher than houses, in an effort to stave off flooding (Kelley 1959; 57-59).
Figure 8-1: Debris tailings from hydraulic mining just north of Nevada City, California, 1880. Photo courtesy of the Nevada County Historical Society.
One of the earliest legal attempts to stop hydraulicking occurred in 1874. A Butte County orchard owner sued to stop one of the largest mines after debris flooding destroyed his land. The farmer's suit gained considerable support from Valley residents, but it was dismissed because of the great value of the mine, compared to the farm and the inability of a bi-partisan jury of miners and farmers to assign blame. At the time of the suit, there were over 50 active mines of various types operating on the tributaries of the river in question, Dry Creek. In addition, a number of closed mines had contributed to the debris accumulation during their periods of operation earlier (Ibid.; 59-63).

The loss of this lawsuit angered and frustrated farmers, but did not stop their legal efforts. Central Valley agriculturalists, aided by townsfolk of Marysville, Sacramento, and other affected cities, led repeated and increasingly well-organized legal, attacks on hydraulic mining, particularly after high runoffs led to flooded towns. In 1875, water topped the artificial levees at Marysville, filling the city like a bowl with mud and water. One small boy was drowned and scores of homes and businesses were ruined. Sand and mud filled every building and basement after the water receded. It took many months to clean and rebuild the town. A year later, rebuilt and higher levees barely saved Marysville from a reoccurrence of the
same fate. In 1878, a huge flood inundated the entire lower Sacramento Valley. Only Marysville and Sacramento were safe, nestled behind their great breastworks.

After an aroused public meeting in Yuba City, a bill was introduced in the state legislature in 1876 to outlaw debris deposition in stream courses. Miners barely defeated the bill with the aid of San Franciscan legislators, their traditional allies. A state court outlawed debris dumping in 1878, but the decision was overturned in 1879 to the relief of California miners. Continued floods, added lawsuits, and organization on both sides of the issue inflated bitterness. Drawing on support from San Francisco, the miners narrowly defeated several more anti-debris measures from 1878 to 1882. But pressure grew as more and more fields and farms were damaged, more and more money was spent by valley towns to keep back the muddy waters, and more and more the State Government came to reflect the power and wealth of agriculture versus the fading mineral industry (Ibid.; 97-129).

A series of suits from 1882 to 1884 removed one stumbling block after another toward a complete injunction against hydraulicking. Moderates attempted to implement a compromise plan of complete levee enclosure of all affected rivers from the foothills to the Bay. Their efforts were angrily brushed aside by the bitter opponents. In 1882, the landmark case went before Judge Lorenzo Sawyer
in San Francisco. The suit was brought by farmer Edwards Woodruff against the North Bloomfield Hydraulic Mining Company and all other mines on the Yuba River. The real opponents were the Anti-Debris Association, formed by valley farmers and businessmen, and the California Miner's Association. On January 7, 1854, Judge Sawyer delivered his decision. Hydraulic mines were permanently enjoined from depositing material in the streams or allowing anyone else to use their water or facilities to do so. The farmers had total victory while the mining counties "received the news as they would a death sentence" (Ibid.; 223-242).

The effect on mining was catastrophic. Yale, in his 1899 (p. 257) review of the subject, reported the following:

On the large mines operations were suspended and many costly works were allowed to go to decay. Mining camps were deserted and large districts were depopulated. The miners, in many cases, persisted in continuing to work their mines, and the Anti-Debris Association, composed of farmers of the Sacramento River Valley, carried on an organized opposition to hydraulic mining. Long and costly litigation and bitter controversy between the farmers of the valley and the miners of the mountains resulted, and this continued for years. Meantime, mine after mine was closed down and the mining property, ditch systems, etc., became worthless.
The closing down of these mines materially reduced the gold yield of the State. The water companies which sold the miners water were enjoined from such sale, and the ditch properties also became worthless. The great reservoir systems with ditches, flumes, pipe lines, etc., were partially abandoned and, in some cases, the dams were blown up and destroyed. Thousands of men were thrown out of employment, and whole camps and villages in the mining regions were deserted.

Efforts to reconstruct the industry began immediately, and despite the financial problems caused by Judge Sawyer's decision, grew in strength. During a meeting of representatives of all hydraulic mining counties in the early 1890s, valley farmers agreed to support a measure allowing resumption of hydraulicking, with the stipulation that the miners would do nothing beyond the law. Suggestions were considered, adopted, and forwarded to Congress.

The result of this action was the Caminetti Act of March 1893. Under this act, hydraulic miners could operate if they built dams and reservoirs to impound their tailings and prevented them from entering navigable streams or injuring the lands of other parties. This essentially meant impounding the debris close to the mining site because farmlands sprinkled the lower foothills and most of the larger rivers like the Yuba and American were considered
navigable in the eastern Central Valley (Kelley 1959; 256-259).

The upper portions of the mining counties experienced a brief boom once again, as hydraulickers began their activities anew. However, early hopes that this would mean a return to virtually carte-blanche operations were dashed by new suits and injunctions enforcing the Sawyer decision and the specifics of the Caminetti Act. When the magnitude of costs required for impoundment facilities was ascertained, all but a few hydraulic mines gave up and gloom settled again along the Tertiary ridges.

The California Miner's Association attempted from time to time to reopen the hydraulic mining question. They proposed construction of high dams on the Yuba and on other rivers. Funding was to be provided by the government, of course. Pleas for studies of the risks and value of resumption of hydraulicking were made in the hopes that recommendations favorable to mining would result. The federal government finally sent eminent geologist Grove Karl Gilbert in 1904 to measure the amount of debris hydraulicking had produced to date, record its distribution, and make recommendations on the feasibility of reopening the mines. Gilbert and his assistants conducted an exhaustive study for thirteen years. He estimated that hydraulic mining had deposited one and one-half billion cubic yards of material in the Sacramento and San Joaquin river
systems. This amount of material dwarfed the debris from other forms of mining as well as that of erosion, itself accelerated by road construction on steep grades and over-grazing (Table 8-1) (Gilbert 1981; 372). The debris poured into the rivers of the Sierra Nevada and thence to the valley, the bays of Suisun, San Pablo, and San Francisco, and the ocean beyond. The areas of greatest deposition were the piedmont zone adjacent to the foothills and the system of bays leading to the Golden Gate (Table 8-2). The navigability not only of the rivers, but of the bays and port of San Francisco were threatened by debris deposition. Gilbert recommended against full resumption of hydraulicking.

Hydraulic mining was dead. In 1900, the Bureau of Mines for California recorded only 18 operating hydraulic mines in the Central Mines counties, as compared to over two hundred two decades earlier. These smaller mines continued operations off and on for years, but they were mere shadows of an earlier, glorious epoch in California mining. As late as 1927, attempts were still being made to reopen operations on a large scale, with elaborate schemes for debris impoundment, but no serious efforts transpired (Report of the State Mineralogist 1927; 54-63).

Drift mining took the place of hydraulicking where possible. It was a tenuous existence based on occasional rich pockets of Tertiary placers, controlled water supply, sage management, and not a little luck. Some 180 drift
### Table 8-1: Sources of Depositional Material, Sacramento and San Joaquin River Systems

<table>
<thead>
<tr>
<th>Source</th>
<th>Cubic Yards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic Mining</td>
<td>1,555,000,000</td>
</tr>
<tr>
<td>Placer Mining</td>
<td>60,000,000</td>
</tr>
<tr>
<td>Quartz Mining</td>
<td>50,000,000</td>
</tr>
<tr>
<td>Drift Mining</td>
<td>30,000,000</td>
</tr>
<tr>
<td>All Forms of Mining</td>
<td>1,695,000,000</td>
</tr>
<tr>
<td>Other Sources of Erosion</td>
<td>700,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,395,000,000</strong></td>
</tr>
<tr>
<td>Unaccountable Error</td>
<td>-20,000,000</td>
</tr>
<tr>
<td>Gilbert's Total</td>
<td>2,375,000,000</td>
</tr>
</tbody>
</table>

(After: Gilbert, 1918)

### Table 8-2: Distribution of Depositional Material

<table>
<thead>
<tr>
<th>Location</th>
<th>Cubic Yards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposited within the Mountains</td>
<td>265,000,000</td>
</tr>
<tr>
<td>Piedmont Deposits</td>
<td>520,000,000</td>
</tr>
<tr>
<td>Deposits in the Channels of Valley Rivers</td>
<td>100,000,000</td>
</tr>
<tr>
<td>Deposits on Inundated Lands</td>
<td>294,000,000</td>
</tr>
<tr>
<td>Deposits in the Bays</td>
<td>1,146,000,000</td>
</tr>
<tr>
<td>Deposits in the Ocean</td>
<td>50,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,375,000,000</strong></td>
</tr>
</tbody>
</table>

(After: Gilbert, 1918)
mines in 1900 scratched out the gold that two decades earlier had been blasted from the Central mines ridges by booming streams of water under high pressure (California Bureau of Mines 1900). The Tertiary gravels continued to yield their ancient placer deposits, but now at a begrudging, limited, and expensive rate.

**Quartz Mining**

The legal blow administered to hydraulic mining was felt throughout the mineral industry. The growth of quartz mining, the most significant remaining form of gold extraction, paused momentarily as wary investors surveyed the financial and legal climates before proceeding in their expansive pursuit of the rock encased mineral. This pause lasted only a short time, however, as technological advances in mining and sulphuret reduction, and improvements in business, management, and scientific operations continued to better the industry. Hard rock mining steadily increased until, by 1900, the amount of gold produced by deep mines in the four counties equalled 80 percent of the total production for all forms of gold mining in 1880 (Yale 1899; 40).

Advances in mining and milling resulted from technological improvements. The most important were the full adoption of dynamite and air drills. Both had met with stern antagonism from miners after their introduction in
the late 1860s. Strikes in opposition to these tools failed, however, and by the early twentieth century, miners had switched from the cumbersome two-man drill to a lighter and more durable one-man drill. According to the *Mining and Scientific Press* (1961; 226), "where formerly a miner would do 6 to 8 feet of drill-holes in a shift and break 1½ tons of ore, now with a machine drill one man drills 35 feet of holes and breaks 7 tons per shift." The North Star mine, at Grass Valley, formerly required 80 men to supply a 40 stamp mill. Twenty sufficed in 1916 (Ibid.; 226).

The introduction of tool-sharpening machinery also cut labor costs. Power for the machines was cheap, and the savings in wages for tool sharpeners usually made up for the initial outlays for machinery in one or two years. In addition, the efficiency of this method of tool preparation facilitated larger operations and rapid mine development (Ibid.).

These technological improvements allowed mine companies to increase ore production and also enabled them to gain profits from lower grade ores. Speedy exploratory work increased chances of working through barren material and decreased the amount of time a mine might have to suffer operation without renumeration. The incidence of closure due to interrupted production and insufficient capital for exploration curtailed. The grade of ore worth mining continued to fall. By 1900, ores valued at only 3.50
dollars per ton could be worked profitably due to the great increase in ore production per miner. New mines opened or re-opened along the low-grade Mother Lode to take advantage of these improvements (Yale 1899; 4-5). The Cornish, in the early decades of quartz mining, strictly followed a narrow gold vein. "Feeders" or tiny traces of gold leading into the surrounding rock were ignored. Improved mining technology allowed the miners to stope the full width of the vein and its branches all at once. Later, waste rock from both the vein and the feeders was removed. This process left far less gold in the mine (Mining and Scientific Press 1961; 226-227).

Ore milling also improved during these years. Conversion from wood-based steam power to more efficient and cheaper methods, and the adoption of a new mode of sulphuret reduction lowered cost and increased gold extraction. In the 1880s, water-powered mills became common. In the Report to the State Mineralogist for 1890, Nevada County listed 26 quartz mills, of which only three were steam powered. All the rest ran by water power. At the same time, a mine in El Dorado County experimented with electricity for stamp mills. By the early twentieth century, electricity further decreased costs and increased reliability in the operation of mine equipment (Logan 1948; 34).

Cyanidization improved the reduction of sulphurets allowing greater retrieval of gold from processed ore. It
involved the introduction of a sodium cyanide solution that dissolved the encapsulated gold. When zinc was added to the solution, the gold precipitated. Heating in a furnace then evaporated the zinc, leaving behind pure gold. This method was extremely effective and allowed recovery of 95 percent of the gold (Hardrock Trail 197?).

Continued experience with hard rock mining taught valuable lessons to the owners and managers of mines. Improvements in business practices brought gold mining further from the era of speculative, haphazard production toward the structure and procedures of other businesses. Mine foremen sampled ore in the mine, the mill, and the resultant tailings continuously to tightly control operations. Supplies for mine construction and operation were kept in quantity in order to avoid expensive delays. Stopes sufficient for up to two years work were kept open and timbered to assure an adequate supply of ore for efficient mill operation (Mining and Scientific Press 1916; 226). Willingness to spend a lot of money for mine preparations led to greater long range profits. Shafts were sunk 1200 to 1500 feet directly, without stopping to cross-cut or stope, until the planned depth was reached. This procedure immediately created greater opportunities to locate promising veins, but involved large expenditures for hoisting and pumping prior to gold production (Yale 1899; 11). Shaft depth more than tripled in some of the larger ongoing mines, approaching 4000 feet in Sutter Creek and Grass
Valley.

The improvements in mining and milling allowed established mines to continue consolidating their holdings and expanding, and old defunct mines to reopen. New enterprises, drawing on both local and external capital, were undertaken (Ibid.; 6). In the first few years of the twentieth century, the State Mining Bureau enumerated 831 quartz mines in the four Central Mines counties. These mines produced 4,318,259 dollars in gold bullion in 1898, 74 percent of the total production for the region. Quartz mining had assumed its role as the torchbearer for an industry beset by adversity.

Distribution of Mines

The changes experienced by different forms of mining are evident from comparison of Maps 2-1 (p. 65) and 8-1. Three conclusions are immediately evident. First, the total number of mines increased from 707 mines in 1882, to 1,105 in 1900. A negligible percent from each of these totals was located outside the study area. The second change was a proportional increase in quartz mines, particularly in the rich Grass Valley-Nevada City range and along the Mother Lode between Placerville and Amador County. A modest expansion of quartz mining also occurred along a north-south axis in eastern Amador County, centering on Volcano. Finally, Tertiary gravel mining declined in
MAP 8-I DISTRIBUTION OF MINES, 1900

(AFTER: CALIFORNIA DIVISION OF MINES; CA. 1900)
eastern Placer and Nevada Counties, despite the growth of drift mining.

Mining suffered a second blow to one of its successful forms with the enjoinment of hydraulicking, but technological and managerial advances in another mining sector allowed some of the slack to be assumed. Gold production for the Central Mines counties fluctuated but never experienced the severe decline it did in the early 1860s (Table 8-3). Riding intensive effort and great capital ventures, quartz mining carried the gold industry into the twentieth century—still a major factor in the man-land system of the Sierra Nevada foothills.

**Agriculture**

In addition to quartz mining, alternate economic functions continued to expand employment, distribution, and production in the later nineteenth century. Chief among these functions was agriculture. From 1860 to 1880, agriculture in the Central Mines had established a number of important trends, including growth in the number, acreage, and production of farms, gains in its competitive relationship with mining, and increased marketing outside the region. The final two decades of the century reinforced most of these trends. Immigration of more farm labor allowed further geographical expansion and intensification. The number of farms multiplied, and their distribution changed. Acreage
### TABLE 8-3: GOLD PRODUCTION, 1880-1900

<table>
<thead>
<tr>
<th></th>
<th>Amador</th>
<th>El Dorado</th>
<th>Nevada</th>
<th>Placer</th>
<th>Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1880</td>
<td>1,495,053</td>
<td>389,383</td>
<td>2,702,362</td>
<td>838,133</td>
<td>5,424,931</td>
</tr>
<tr>
<td>1881</td>
<td>1,450,000</td>
<td>550,000</td>
<td>3,700,000</td>
<td>850,000</td>
<td>6,550,000</td>
</tr>
<tr>
<td>1882</td>
<td>1,500,000</td>
<td>600,000</td>
<td>3,500,000</td>
<td>800,000</td>
<td>6,400,000</td>
</tr>
<tr>
<td>1883</td>
<td>1,590,000</td>
<td>530,000</td>
<td>3,000,000</td>
<td>810,000</td>
<td>5,930,000</td>
</tr>
<tr>
<td>1884</td>
<td>2,000,000</td>
<td>575,000</td>
<td>2,950,000</td>
<td>887,320</td>
<td>6,412,320</td>
</tr>
<tr>
<td>1885</td>
<td>2,145,591</td>
<td>35,000</td>
<td>2,577,873</td>
<td>906,301</td>
<td>5,664,765</td>
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<tr>
<td>1886</td>
<td>1,874,062</td>
<td>619,992</td>
<td>3,221,038</td>
<td>1,076,663</td>
<td>6,791,755</td>
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<tr>
<td>1887</td>
<td>1,979,956</td>
<td>706,871</td>
<td>2,719,574</td>
<td>855,510</td>
<td>6,261,911</td>
</tr>
<tr>
<td>1888</td>
<td>1,750,000</td>
<td>650,000</td>
<td>2,600,000</td>
<td>850,000</td>
<td>5,850,000</td>
</tr>
<tr>
<td>1889</td>
<td>1,560,975</td>
<td>427,638</td>
<td>2,249,335</td>
<td>1,245,491</td>
<td>5,483,439</td>
</tr>
<tr>
<td>1890</td>
<td>1,459,952</td>
<td>204,583</td>
<td>1,969,613</td>
<td>1,003,602</td>
<td>4,637,750</td>
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<tr>
<td>1891</td>
<td>1,395,962</td>
<td>173,279</td>
<td>2,207,886</td>
<td>998,495</td>
<td>4,775,622</td>
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<tr>
<td>1892</td>
<td>1,210,383</td>
<td>198,321</td>
<td>1,945,406</td>
<td>1,159,080</td>
<td>4,513,190</td>
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<tr>
<td>1893</td>
<td>1,505,973</td>
<td>294,610</td>
<td>2,067,203</td>
<td>1,351,250</td>
<td>5,219,036</td>
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<tr>
<td>1894</td>
<td>1,331,916</td>
<td>366,707</td>
<td>1,830,155</td>
<td>1,851,215</td>
<td>5,379,993</td>
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<tr>
<td>1895</td>
<td>1,391,929</td>
<td>700,101</td>
<td>1,789,816</td>
<td>1,599,635</td>
<td>5,481,481</td>
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<tr>
<td>1896</td>
<td>1,523,351</td>
<td>812,289</td>
<td>2,380,756</td>
<td>1,674,844</td>
<td>6,391,240</td>
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<tr>
<td>1897</td>
<td>1,324,472</td>
<td>674,626</td>
<td>1,885,251</td>
<td>1,524,941</td>
<td>5,409,290</td>
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<tr>
<td>1898</td>
<td>1,806,363</td>
<td>501,966</td>
<td>2,017,628</td>
<td>1,488,022</td>
<td>5,813,979</td>
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<tr>
<td>1899</td>
<td>1,544,868</td>
<td>404,497</td>
<td>2,171,510</td>
<td>1,100,081</td>
<td>5,220,956</td>
</tr>
<tr>
<td>1900</td>
<td>1,373,788</td>
<td>368,541</td>
<td>1,812,036</td>
<td>986,155</td>
<td>4,540,520</td>
</tr>
</tbody>
</table>

**TOTAL** 33,214,594 9,783,404 51,297,442 23,856,738 118,152,178
increased at an even faster rate. External markets increased demand and influenced production and diversity. Use of former mining infrastructure increased and further entrenched agriculture as heir apparent to leadership in population support.

Statewide agriculture was a mixed blessing for Central Mines farmers. Advances by Central Valley growers had diffused crops, market inducements, and a sense of confident optimism to the Central Mines. But, statewide agriculture also meant competition. During the remaining years of the nineteenth century, competition from coastal valleys and southern California, aided by transport advantages, grew stronger and more damaging. This competition eventually caused serious problems for some crops in the foothills region.

**Increased Farms and Farm Acreage**

Federal distribution of land to private settlers increased in the last two decades of the century. From 1881 to 1900, 439,452 acres were patented, a 164 percent increase over the total land patented prior to 1881. Three patterns characterized this rapid expansion of land alienation:

1. Distribution of patented lands was much wider.
2. Despite this, traditional areas of concentration were maintained.
3. Homestead patents were the most common form of
land acquisition.

Each pattern illustrated agriculture's growing role in the economic system of the Central Mines.

Major expansion of settlement and agriculture occurred from 1881 to 1900. In half of the measured townships, at least 25 percent of the total land was patented during the two decades. Two broad zones were important (Map 8-2). Landholding in the western edge of the region intensified, particularly in southern Nevada and northwestern El Dorado counties. A second, larger zone, consisted of the middle and eastern portion of Amador and El Dorado counties. Many farmers settled along the Placerville Wagon Road and its feeder trails and on the old mining ground between Grizzly Flat and Volcano. This spatial expansion illustrated healthy trends in Central Mines agriculture—a balanced expansion into all available agricultural niches and a willingness to settle and develop more marginal climatic zones.

Despite dispersal of land grants, established areas maintained their leads in farms and acreage. Most established farm zones had an enormous lead in land alienation by 1800. Some townships, with these new patents became almost completely privately owned. This was particularly the case around the mining centers of Amador County and in the eastern portions of Ione Valley. By 1900, the total amount of land that had been alienated by cash purchase, military scrip patent, and homesteading was 39 percent of
MAP 8-2: TOTAL LANDS PATENTED FROM 1881 TO 1900

one dot = 500 acres

NO DATA
the total land in the study area. But more than 50 percent of the land was privately held in each of the southern and western units and close to 80 percent in some. Only the rugged, timbered mountains of eastern Nevada and Placer counties kept the regional percent so low.

Homesteading advanced rapidly during this period. Ambitious settlers overcame initial confusion and hesitancy and flocked to various frontiers to avail themselves of the opportunity. During the twenty years, 61 percent of all land acquired in the Central Mines region was by the provisions of the Homestead Act of 1862. The distribution of homestead patents was even more dispersed than that of total land patents. This confirms that new farms were being located, throughout much of the region, in hitherto inaccessible or unpopular areas.

The rate of failure of homestead grants continued at 31 percent from 1881 to 1900, precisely that of the years preceding 1881. In addition, the highest rates of failure continued to be in the areas of greatest agricultural concentration and production. Farmers sought these because of their higher value per acre compared to underdeveloped areas. The four Central Mines counties contained improved and non-bearing orchard land that was worth considerably less than that of the state (Table 8-4). However, Placer County, with its farms along the Central Pacific right of way, assessed its cropland at values well above the state
average. If a homestead patent in this area failed, its availability for resettlement would be a matter of interest to potential settlers and land investors.

**TABLE 8-4: Average Values of Improved Land, 1893**

<table>
<thead>
<tr>
<th></th>
<th>Value of Improved Land</th>
<th>Value of Orchard Land (Bearing)</th>
<th>Value of Orchard Land (Non-Bearing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amador</td>
<td>$28.00</td>
<td>117.00</td>
<td>40.00</td>
</tr>
<tr>
<td>El Dorado</td>
<td>25.00</td>
<td>70.00</td>
<td>25.00</td>
</tr>
<tr>
<td>Placer</td>
<td>30.00</td>
<td>200.00</td>
<td>30.00</td>
</tr>
<tr>
<td>State*</td>
<td>50.26</td>
<td>153.20</td>
<td>64.73</td>
</tr>
</tbody>
</table>

*51 counties only. Among those not recorded was Nevada County.

Source: *Transactions of the State Agricultural Society, 1895*, p. 112.

In addition to lands alienated to private settlers, another 111,174 acres were granted to various railroad companies, mainly the Southern Pacific. The railroads, thus, had received 264,021 acres in these ninety township and range units. With vast increases in homesteading these lands continued to remain largely in the hands of the railroad.

The rapid alienation of new lands accompanied increases in both farm number and average size. Nearly 1,000 new farms appeared in the 1900 census raising the total to 2,917. Average farm size increased from 271 acres to 338 bringing it much closer to the state average. Farm size varied widely among the four counties (Table 8-5). Amador
TABLE 8-5: FARM SIZE CHANGES FROM 1880-1900

<table>
<thead>
<tr>
<th></th>
<th>Amador</th>
<th>El Dorado</th>
<th>Nevada</th>
<th>Placer</th>
<th>4 Counties</th>
<th>Percent of State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farms 1880</td>
<td>531</td>
<td>542</td>
<td>356</td>
<td>514</td>
<td>1,943</td>
<td>5.4</td>
</tr>
<tr>
<td>Farms 1900</td>
<td>560</td>
<td>759</td>
<td>522</td>
<td>1,076</td>
<td>2,917</td>
<td>4.0</td>
</tr>
<tr>
<td>Acres 1880</td>
<td>128,831</td>
<td>132,163</td>
<td>76,259</td>
<td>189,590</td>
<td>526,043</td>
<td>3.2</td>
</tr>
<tr>
<td>Acres 1900</td>
<td>214,024</td>
<td>209,320</td>
<td>120,743</td>
<td>440,371</td>
<td>984,458</td>
<td>3.4</td>
</tr>
<tr>
<td>Farms &lt; 3 Acres 1880</td>
<td>1</td>
<td>5</td>
<td>-</td>
<td>3</td>
<td>9</td>
<td>1.5</td>
</tr>
<tr>
<td>Farms &lt; 3 Acres 1900</td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>12</td>
<td>22</td>
<td>1.5</td>
</tr>
<tr>
<td>3-10 1880</td>
<td>10</td>
<td>11</td>
<td>6</td>
<td>14</td>
<td>41</td>
<td>2.1</td>
</tr>
<tr>
<td>3-10 1900</td>
<td>7</td>
<td>21</td>
<td>24</td>
<td>58</td>
<td>110</td>
<td>2.1</td>
</tr>
<tr>
<td>10-20 1880</td>
<td>9</td>
<td>17</td>
<td>13</td>
<td>9</td>
<td>48</td>
<td>1.8</td>
</tr>
<tr>
<td>10-20 1900</td>
<td>9</td>
<td>25</td>
<td>26</td>
<td>85</td>
<td>145</td>
<td>1.8</td>
</tr>
<tr>
<td>20-50 1880</td>
<td>22</td>
<td>33</td>
<td>23</td>
<td>33</td>
<td>111</td>
<td>3.2</td>
</tr>
<tr>
<td>20-50 1900</td>
<td>33</td>
<td>57</td>
<td>75</td>
<td>257</td>
<td>422</td>
<td>3.2</td>
</tr>
<tr>
<td>50-100 1880</td>
<td>48</td>
<td>58</td>
<td>51</td>
<td>61</td>
<td>218</td>
<td>5.2</td>
</tr>
<tr>
<td>50-100 1900</td>
<td>60</td>
<td>96</td>
<td>64</td>
<td>196</td>
<td>416</td>
<td>5.2</td>
</tr>
<tr>
<td>100-500 1880</td>
<td>416</td>
<td>379</td>
<td>242</td>
<td>329</td>
<td>1,366</td>
<td>5.7</td>
</tr>
<tr>
<td>100-500 1900</td>
<td>381</td>
<td>466</td>
<td>274</td>
<td>382</td>
<td>1,503</td>
<td>5.7</td>
</tr>
</tbody>
</table>

(Table 8-5 continued on next page)
<table>
<thead>
<tr>
<th></th>
<th>Amador</th>
<th>El Dorado</th>
<th>Nevada</th>
<th>Placer</th>
<th>4 Counties</th>
<th>Percent of State</th>
</tr>
</thead>
<tbody>
<tr>
<td>500-1,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1880</td>
<td>15</td>
<td>27</td>
<td>15</td>
<td>37</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>42</td>
<td>55</td>
<td>44</td>
<td>49</td>
<td>190</td>
<td>3.6</td>
</tr>
<tr>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td>10</td>
<td>12</td>
<td>6</td>
<td>28</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>27</td>
<td>32</td>
<td>13</td>
<td>37</td>
<td>109</td>
<td>2.3</td>
</tr>
<tr>
<td>Average Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td>243</td>
<td>244</td>
<td>214</td>
<td>369</td>
<td>271</td>
<td>462</td>
</tr>
<tr>
<td>1900</td>
<td>382</td>
<td>276</td>
<td>231</td>
<td>409</td>
<td>338</td>
<td>397</td>
</tr>
</tbody>
</table>
County, which gained many new land patents, increased its number of farms by only 29, a paltry five percent. The new lands were added to existing farms. The average farm size for this county jumped 57 percent to 328 acres, near the state average.

Both El Dorado and Nevada Counties increased farms and farm size. El Dorado County added 217 new units while Nevada County increased by 166. Farm size increased thirteen and seven percent, respectively, but remained well behind the averages for the region and the state.

Placer County, with its established orchard industry and valuable rail links, experienced the greatest growth. Farms doubled in number raising the county's share to more than one-third of the region. The already large farm size increased further to 409 acres per holding. This average exceeded even that of the state with its huge valley grain farms. The average for Placer County includes two townships within the Central Valley and outside the study area, but they contained no more than fifteen percent of the total farms. Zones around Rocklin, Penryn, Auburn, and Clipper Gap continued to function as the leading agricultural producer of the Central Mines. Curiously, while all four counties experienced increases in farm size, the most numerous new farms were those below 50 acres in size. Placer County accounted for more than two thirds of these small, usually irrigated
units. Amador County, on the other hand, led a trend toward very large farms. A 100 percent increase in units over 500 acres more than offset the new small farms.

Production and Diversity

Most farms in the Central Mines region produced a variety of commodities in 1880. Five types of crops occurred not only through the four counties but often on the same farm. Livestock, grain, grapes, fruit, and other crops all experienced production changes as the local agricultural system continued to evolve its marketing, competitive, and ecological character (Table 8-6).

The increase of private farmlands at higher elevations removed much of the land available for pasture of animals in the established system of transhumance. The creation of national forests removed still more land from the open range. Government foresters and other officials sharply curtailed burning of woodland to create pasture and uncontrolled stripping of the range resources by passing animals. As a consequence of these changes, the number of sheep in the region fell 60 percent. Three-fourths of the remaining sheep were held on farms in western Placer County. Livestock-raising on farms better suited cattle and the number of beef cattle grew substantially, particularly on the new larger farms of Amador County. The swine production population also decreased due to reduc-
TABLE 8-6: CROP AND LIVESTOCK STATISTICS FOR THE CENTRAL MINES, 1880-1900

<table>
<thead>
<tr>
<th></th>
<th>Amador</th>
<th>El Dorado</th>
<th>Nevada</th>
<th>Placer</th>
<th>4 Counties</th>
<th>Percent of State</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cattle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td>6,878</td>
<td>10,370</td>
<td>5,035</td>
<td>4,608</td>
<td>26,891</td>
<td>4.1</td>
</tr>
<tr>
<td>1900</td>
<td>15,907</td>
<td>10,681</td>
<td>7,288</td>
<td>6,602</td>
<td>40,478</td>
<td>2.8</td>
</tr>
<tr>
<td><strong>Sheep</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td>25,008</td>
<td>18,000</td>
<td>2,791</td>
<td>58,805</td>
<td>104,604</td>
<td>2.5</td>
</tr>
<tr>
<td>1900</td>
<td>4,127</td>
<td>3,229</td>
<td>3,142</td>
<td>32,432</td>
<td>42,930</td>
<td>1.7</td>
</tr>
<tr>
<td><strong>Swine</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td>6,775</td>
<td>3,954</td>
<td>3,195</td>
<td>5,893</td>
<td>19,817</td>
<td>3.3</td>
</tr>
<tr>
<td>1900</td>
<td>5,219</td>
<td>3,311</td>
<td>1,656</td>
<td>3,146</td>
<td>13,332</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>Value Livestock</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td>296,372</td>
<td>297,629</td>
<td>188,255</td>
<td>379,810</td>
<td>1,162,066</td>
<td>3.3</td>
</tr>
<tr>
<td>1900</td>
<td>510,890</td>
<td>361,894</td>
<td>280,030</td>
<td>487,351</td>
<td>1,640,165</td>
<td>2.4</td>
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<tr>
<td><strong>Orchard Trees</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*1890</td>
<td>54,742</td>
<td>184,793</td>
<td>33,950</td>
<td>325,440</td>
<td>598,925</td>
<td>9.7</td>
</tr>
<tr>
<td>1900</td>
<td>67,455</td>
<td>230,260</td>
<td>113,350</td>
<td>1,137,095</td>
<td>1,548,160</td>
<td>5.5</td>
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<tr>
<td><strong>Value Orchard</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td>34,903</td>
<td>82,648</td>
<td>26,546</td>
<td>64,697</td>
<td>208,794</td>
<td>10.4</td>
</tr>
<tr>
<td>1900</td>
<td>39,766</td>
<td>64,438</td>
<td>28,960</td>
<td>535,307</td>
<td>668,471</td>
<td>12.2</td>
</tr>
<tr>
<td><strong>Value Market Garden</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td>10,390</td>
<td>9,409</td>
<td>14,790</td>
<td>17,445</td>
<td>52,034</td>
<td>6.5</td>
</tr>
<tr>
<td>*1890</td>
<td>12,252</td>
<td>1,540</td>
<td>8,557</td>
<td>27,947</td>
<td>50,296</td>
<td>3.5</td>
</tr>
<tr>
<td><strong>Wine (Gallery)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*1890</td>
<td>80,000</td>
<td>128,000</td>
<td>18,800</td>
<td>177,700</td>
<td>404,500</td>
<td>3.2</td>
</tr>
<tr>
<td>1900</td>
<td>13,066</td>
<td>49,597</td>
<td>11,253</td>
<td>16,631</td>
<td>90,547</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>Acres Grain</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+1880</td>
<td>6,868</td>
<td>2,510</td>
<td>879</td>
<td>17,505</td>
<td>27,762</td>
<td>1.1</td>
</tr>
<tr>
<td>1900</td>
<td>8,045</td>
<td>1,667</td>
<td>571</td>
<td>36,742</td>
<td>47,025</td>
<td>1.2</td>
</tr>
</tbody>
</table>

(Table 8-6 continued on next page)
TABLE 8-6: CROP AND LIVESTOCK STATISTICS FOR THE CENTRAL MINES, 1880-1900 CONTINUED

<table>
<thead>
<tr>
<th></th>
<th>Amador</th>
<th>El Dorado</th>
<th>Nevada</th>
<th>Placer</th>
<th>4 Counties</th>
<th>Percent of State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Forest Products</td>
<td>1880</td>
<td>55,621</td>
<td>38,604</td>
<td>70,982</td>
<td>46,961</td>
<td>212,168</td>
</tr>
<tr>
<td></td>
<td>1900</td>
<td>42,757</td>
<td>61,585</td>
<td>70,588</td>
<td>47,771</td>
<td>222,701</td>
</tr>
<tr>
<td>Value All Production</td>
<td>1880</td>
<td>453,166</td>
<td>482,115</td>
<td>271,129</td>
<td>618,772</td>
<td>1,825,182</td>
</tr>
<tr>
<td></td>
<td>1900</td>
<td>479,830</td>
<td>543,446</td>
<td>421,769</td>
<td>1,407,737</td>
<td>2,852,782</td>
</tr>
<tr>
<td>Farms</td>
<td>1880</td>
<td>531</td>
<td>542</td>
<td>356</td>
<td>514</td>
<td>1,943</td>
</tr>
<tr>
<td></td>
<td>1900</td>
<td>560</td>
<td>759</td>
<td>522</td>
<td>1,076</td>
<td>2,917</td>
</tr>
</tbody>
</table>

* 1880 or 1900 figures not available, orchard figures are bearing trees only

+ Includes only wheat, corn, and barley

Source: U.S. Census of Agriculture
tion of the open range and the virtually complete removal of a marketing mainstay, the Chinese. Overall, livestock decreased in number and relative importance to the region, though the shift from sheep to cattle increased the value of livestock by 40 percent.

Grain-growing faced a series of problems beginning in the early 1890s. Overproduction and competition from the burgeoning Great Plains and Australian ranges cut demand, and encroachment by other crops and increased land values forced shifts to more intensive agriculture (Reed 1946; 253). Farmers in the Central Mines maintained a small grain production during these two decades, but followed the lead of the Central Valley in shifting from wheat to barley. In addition, greater acreage was devoted to other feed crops as King Wheat slowly relinquished its statewide leadership.

The effects of competition were most severely felt in grape production. The local wine industry was no match for Napa and Sonoma counties which, by their success in quality, had even bypassed Los Angeles. Meanwhile, local table grape production was dwarfed by huge outputs from Fresno and other San Joaquin Valley counties. Wine production decreased by more than 75 percent from 1890 to 1900 (Table 8-6). Exact statistics are lacking, but secondary evidence suggests equal if not greater declines in other grape products (Transactions, State Agricultural Society 1904).
Fruit continued to be the leading commodity in Central Mines agriculture. Value of orchard products tripled during the two decades as hundreds of thousands of new trees were planted. Deciduous fruit dominated production as it had since the days of the gold rush, but farmers successfully tried other products. Olives, walnuts, almonds, and assorted citrus fruits each become interesting, successful alternatives. One experiment in citrus culture was attempted by a group of English settlers. In 1890, they founded the Penryn citrus colony. Two years later, nearly 40 English landowners had planted orange trees, built homes, and started an agricultural college. A nationwide depression in the mid-1890s badly hurt their incipient marketing, and most sold out and departed by 1900. However, when things returned to normal the few colonists who remained, plus those new holders of the colony's land, did very well (Lardner 1924; 199-200).

Among deciduous fruits, peaches continued to dominate, accounting for more than half the total orchard trees by 1900. Planting of pears advanced most rapidly, however, especially in Nevada County. Large pear orchards along the Nevada County Narrow Gauge Railroad, grew enough fruit to permit this hitherto unsuccessful farming county to become a leading producer in the state. Plums and prunes also became important products, as acreage in apples declined due to competition from the valleys north of San Francisco Bay.
Placer County, with its valuable rail link, continued to control fruit production in the region. More than 73 percent of the orchard trees in the Central Mines were located along the railroads in western and central Placer County. The town of Newcastle became a pivotal point for shipping fruit eastward, while areas around Penryn, Rocklin, Loomis (formerly Pino), Auburn, Dutch Flat and others added to the local production. By 1923, although spatial expansion had continued, Newcastle shipped 44 percent of all fruit exported from Placer County.

The growth of fruit production and its role in external marketing are illustrated by the following statistics. In 1876, the area around Newcastle shipped approximately one million pounds of fruit in 40 railroad carloads. Thirteen years later, nearly 6,000,000 pounds in 176 carloads were shipped. Subsequently, production and export increased even more rapidly to 300 carloads in 1891, 526 in 1893, 1855 in 1908, and 2547 in 1923. These shipments represented an important component of the total state deciduous fruit crop, especially the peach crop.

External marketing was always the key in Central Mines orcharding. Growers, however, were subject to two dismaying factors in using this market—fluctuations in Eastern demand and high railroad charges. Eastern orchards were subject to more crop failures than California's, but still provided strong competition in the Eastern market. High
nationwide production led shippers to wait until the production of California reached its annual maximum and prices were depressed before buying. This practice angered local growers, but they were powerless to contend with it. Railroad rates were very high also. The refrigerator car became available in 1869, and rates to Chicago ranged from 185 to 245 dollars per car above the regular charge of 300 dollars. These exorbitant charges placed a heavy burden on growers that led to financial failure during the depression of the 1890s (Powell 1910: 402-403).

Cooperation was the obvious answer. The California Fruit Union was incorporated in 1885 after early local attempts at collective bargaining with the railroad had failed. The purpose of the association of growers was to control marketing by timing shipments in order to keep prices high. Local cooperatives, including one in Placer County, were induced to join, but support was hesitant and the Union never really gained control of shipping. The Union ended by 1894 after failures to influence railroad rates.

Various other attempts at cooperation were made in the state, primarily by Los Angeles and Santa Clara Valley growers. All failed because of weak support in the face of solid railroad and middlemen opposition. Despite these failures, growers did make slight advances in convincing the railroads to moderate their profit-seeking at the expense of growers, in organizing distribution, and
and in distributing the negative effects of overproduction. Placer County in particular was deeply embroiled in these marketing problems and its growers were among the leaders in founding and maintaining deciduous fruit cooperatives. Though successes were few in the nineteenth century, growers laid the foundation for later cooperation. The California Fresh Fruit Exchange formed, after the turn of the century, as the new statewide organization for deciduous fruit. It later became a successful cooperative, and helped overcome some of the marketing problems burgeoning fruit industry (Wickson 1923; 288-303: Powell 1910; 393-419).

The fruit-growing industry continued to achieve independence from mining and the local man-land system. Mining still influenced agriculture, however. The local market was still a substantial one. Close to 50,000 people lived in the Central Mines townships and provided a large and constant demand for the 2,917 farms operating in the region. Fruit-growing increasingly depended on mining infrastructure, mainly water distribution systems. According to the 1900 census of agriculture, 42.3 percent of the farms in the four counties were irrigated. Nevada and Placer counties, with the water systems originally used in hydraulicking, irrigated half of their farms, while El Dorada and Amador watered 39 and 25 percent, respectively. Much of this water furnished electricity and served the mines before reaching the orchards (Robertson and Nelson 1915; 351).
In a few areas, agriculture became more specialized. Declining grape and sheep production and increasing fruit production, led such areas as western Placer County to resemble farms in the state's coastal and valley regions. Diversified farming still characterized most of the Central Mines, however. Farmers grew hay, vegetables, some grain, and harvested forest products in addition to growing fruit. Local agricultural experts continued to promote diversified farming as the path to success. The following model provided an illustrative lesson according to the State Agricultural Society (*Transactions* 1908; 30-31). An earlier unsuccessful farmer:

gave up in disgust and sold the place for $3,500. The new owner expended $1,000 in changing conditions, put $500 in cows and chickens, making the place stand him $5,000. He had ten good grade cows, costing him $40 each, one hundred young laying hens, ten turkey hens, two gobblers, four horses and ten hogs. He increased his alfalfa patch to eight acres and put the rest of the rye grass patch into berries, fruits, and vegetables. This took the twenty-one acres of bottom land. On his hill land he increased his orchard to five acres and his vineyard to five acres. His house grounds, with stables, corrals, poultry yards and lawn covered three acres, leaving six acres of timber around the springs which supplied
the place with water. This timber furnished all necessary firewood. The forty-acre place was now managed on proper lines and brought the owner, who used both brains and hands $3,000 a year income.

In summary, improvements in marketing and transport, rapid development of orchard production, intensive use of mining flumes for irrigation, and large increases in the number of farms and total acreage characterized agriculture in the Central Mines during the closing years of the century. Orchards, in particular, boded well for the future of agriculture. The groundwork for successful solution of many of the remaining problems by cooperation had been laid as well. Repeated calls for people willing to work hard were sent from the region by various promotional committees. As mining again faltered, agriculture continued to develop its apparent role as the leading form of land use in the old mining region.

Other Economic Functions

Other economic activities also contributed toward increased independence from mining. The lumber industry grew as the company mills replaced part-time and amateur wood cutters. Lumbering became firmly established as an important industry in its own right. Railroad construction slowed, but the rail links were sufficient to draw the
region further into the wider economic system of the state. Finally, moves were made that fostered the recreation industry. Each of these steps carried the Central Mines further from the monofunctional economy of its mining past.

The closing decades of the nineteenth century were important in California for expansion and consolidation of the lumber industry. Many changes experienced by the large companies of the Great Lakes were mirrored in the Golden State, occasionally led by big corporations from the states of Michigan and Wisconsin. In the Central Mines, large companies like the Michigan and California Lumber Company and the California Door Company produced millions of board feet, dwarfing earlier operations and absorbing many of them. Vertical integration and enlargement of operations resulted in several significant changes in the local lumber industry. First, production declines that characterized the period from 1860 to 1880 reversed. Accurate county figures are lacking but statistics for the state show an increase of 92 percent in ponderosa and sugar pine production. The state increase is likely to be an accurate estimate of the production increase in the Central Mines, one of the principal ranges of those species (May 1953; 14).

A greater proportion of the lumber products came from professional lumber companies than from amateurs. The pro-
duction of shingles declined drastically, while forest products from the region's ever more numerous farms rose only five percent from 1880 to 1900 (Table 8-6). Compared to the increase in products from lumber mills, these non-corporate contributions were insignificant.

Finally, with multi-state corporations and large scale production, marketing oriented toward extra-regional and non-mining customers. Much of the wood cut in the Central Mines went into the construction of boxes to pack fruit (Scott 1970; 107). Building and manufacturing industries in the coastal cities also used local timber products. Some companies extended vertical integration to include lumber cutting and the factories to use it. The California Door Company, in El Dorado County, shipped nearly all its product to Oakland where their factory constructed doors and other prefabricated housing items (Report of the State Forester 1914; 69). By selling outside the region, the lumber industry freed itself from excessive dependence on the fate of mining, but also faced the same transport difficulties and price fluctuations as fruit growers. Seventy-four pine saw-mills formed a cooperative association known as the Central Lumber Company in 1896 to deal with these problems. Due to overproduction and weak support it failed, but like its contemporaries in agriculture, it paved the way for later successful cooperative ventures (Blackford 1977; 64).
One of the changes that aided lumbering as well as other economic functions was the creation of national forests beginning in 1891. Both the Sierra and Tahoe national forests extended into the Central Mines (Map 8-3). The principal beneficial effects were control of grazing and the deliberate burning that often accompanied it, and introduction of scientific forestry to the region's timber reserves. The latter concentrated on prevention and control of forest fires and reforestation of cut-over areas. Scientific forestry measures were promoted less by lumber companies than by farmers and city-dwellers concerned about watershed management. The implementation of its programs materially aided lumber companies and attracted alternate resource users such as recreationalists and power companies (Ibid.; 66-68). The high mountain scenery had attracted some tourists as early as the gold rush period, but the creation of these national forests lured many more. Increased visits by tourists and construction of summer homes in government forests amounted to significant forms of land use by the turn of the century (Mountain Democrat 1928; 16).

The wagon and railroad industries made moderate gains in the Central Mines during the closing years of the nineteenth century. The Placerville Wagon Road regained some of its earlier significance with new agricultural settlement in central and eastern El Dorado County and the extension of the Sacramento and Placerville Railroad to
MAP 8-3: NATIONAL FOREST LANDS - 1909

MAP showing national forest lands in the area of Nevada City, Grass Valley, Placerville, Auburn, Sutter Creek, and Jackson.
Placerville. Meanwhile, the Central Pacific was embroiled in conflicts with farmers and lumbermen over freight rates. The Central Pacific enjoyed high profits and, with its powerful rival, the Southern Pacific, it shared enormous success despite the almost universal anger and distrust of California businesses and residents. Both the wagon road and the railroad were critical lifelines that would carry the Central Mines into the future.

Conclusion

The closing decades of the nineteenth century saw mining suffer another setback with the cessation of hydraulicking. But, by the end of the century, quartz mining had assumed much of the production slack, though it spatially concentrated mining even further. Drift mining survived in Placer County but was insignificant elsewhere. Born of the adversity faced by mining, agriculture, lumbering, and transport continued to evolve from their roles as mining's suppliers. External markets, production increases, and continued beneficial adaptations of mining infrastructure turned the region's focus outward and integrated it into the larger California economy. A multi-faceted land-use system opened the new century.
CHAPTER 9

CHANGES IN POPULATION AND SETTLEMENT PATTERNS, 1880 TO 1900

The closing decades of the nineteenth century saw continued changes in both population and settlement in the Central Mines region. Occupational trends, such as the decrease in the proportion of miners continued, while some processes of demographic change reversed. The shutdown of hydraulic mining further reduced the area's fundamental industry, cutting employment along the eastern, higher elevation areas. However, production and spatial expansion of other primary industries, chiefly agriculture and lumbering, ameliorated this process. Population continued to concentrate in townships with large towns and quartz mining centers, as the remaining residents and new replacements clustered in ever fewer areas of economic opportunity. The population total remained stable, despite changes in the gold industry. This factor indicated the growing strength of alternate land uses.

The settlement pattern also followed trends in the economic sector. Large towns increased their share of the population as former competitors declined. New towns formed in response to expanding agriculture and its links to external markets. Some of the unpredictability in a town's fate abated, but Gold Run, in Placer County, showed that the old boom and bust story could still be retold for parts of the Central Mines.
The economic profile of the four counties continued to evolve from 1880 to 1900. More and more the foothills counties adapted to decline in the carrying capacity of its founding industry. This chapter measures the effect of those adaptations in the occupational, demographic, and settlement profile of the man-land system.

Mineral Population

Data from the twenty percent sample of census population manuscripts attests to a continued decline in the number of miners employed in the region. There was a drop of nearly four thousand men employed in mining from 1880 to 1900 (Table 9-1). This 36.5 percent decrease, though not as severe as that of the previous two decades, reflected the continuing problems the leading industry faced.

Remaining miners clustered further around the few successful zones of gold extraction. Twenty-five of the thirty townships lost miners. The greatest declines occurred in two broad zones associated with the troubled surface mining portions of the industry. Along the northern and eastern segments of the region, the townships dependent on hydraulicking were deleteriously affected (Map 9-1). Bridgeport and Little York lost 813 of the 1038 miners present in 1880. A few areas, such as Placer 6 which contained rich deposits at Michigan Bluff and Forest Hill, escaped serious population losses due to adoption of
<table>
<thead>
<tr>
<th>Occupation</th>
<th>1880</th>
<th>Percent Change 1880-1900</th>
<th>1900</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>10,885</td>
<td>-36.5</td>
<td>6,908</td>
</tr>
<tr>
<td>Percent</td>
<td>43.3</td>
<td>35.4</td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>3,836</td>
<td>+15.0</td>
<td>4,411</td>
</tr>
<tr>
<td>Percent</td>
<td>15.3</td>
<td>22.6</td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>2,753</td>
<td>-35.5</td>
<td>1,777</td>
</tr>
<tr>
<td>Percent</td>
<td>11.0</td>
<td>9.1</td>
<td></td>
</tr>
<tr>
<td>Lumbering</td>
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<td>+20.9</td>
<td>664</td>
</tr>
<tr>
<td>Percent</td>
<td>2.2</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>6,005</td>
<td>-19.2</td>
<td>4,855</td>
</tr>
<tr>
<td>Percent</td>
<td>23.9</td>
<td>24.9</td>
<td></td>
</tr>
<tr>
<td>Total Employed Males</td>
<td>25,139</td>
<td>-22.3</td>
<td>19,533</td>
</tr>
</tbody>
</table>

*Estimated From 20 Percent Sample
MAP 9-1: CHANGES IN MINERS 1880 - 1900 (BY TOWNSHIP)
large-scale drift mining.

The second zone of decline was along the western flank of the region, the area of traditional placering. Pressure from competing land uses, part-time operations by farmers and others, and the emigration of Chinese, further relegated the original form of gold mining.

Townships with quality quartz mining fared well, in marked contrast to the fates of areas dependent on alluvial gold. Grass Valley, Amador 1, and Amador 4, added more than 500 miners between them—a 30 percent increase. In addition, declines for townships like Nevada, where both hydraulic and quartz mining had enjoyed considerable activity, were ameliorated by quartz successes. Because quartz mining was spatially restricted, the trend toward nucleation of remaining miners intensified. In 1880, the five townships with the most miners included two quartz, two hydraulic, and one mixed mining zones. Together they contained 39 percent of all the region's miners. In 1900, the five townships with the largest mining workforces all depended on quartz mining and contained 49 percent of the miners.

The impact of mining decline on the population was lessened by an increase in the number of unemployed dependents on mining. Larger family size and a reduction in the number of footloose and unattached prospectors brought the dependent to worker ratio from 1.91 in 1880 to 2.29 in 1900. The latter approached the ratio for other activities such
as agriculture and services (Table 9-2). Further evidence of the success of the quartz industry and its population stability is evident from comparison of county ratios. El Dorado and Placer, the placer and Tertiary mining zones, had ratios of barely two to one in 1900. Amador and Nevada, however, enjoyed dependent to worker ratios of 2.43 and 2.46 respectively. This variance in family size further intensified the location of mining dependents in towns such as Jackson, Sutter Creek, Grass Valley, and Nevada City. The number of total dependents on mining fell 24 percent from 20,835 to 15,800. Four of every five missing by 1900 were employed miners. Only one was an unemployed dependent.

Two changes affected the birthplace profile of the mining workforce--an increase of California born men in the mines and a decrease in foreign born. Gold mining had always drawn young men. Reinforcing this lure were new, locally born generations of Cornish and Welsh following their fathers into the Grass Valley and Sutter Creek mines. In 1900, 33 percent of all miners had been born in the state whereas in 1880 the percent was barely seven. American miners born outside California continued to form one-fifth of the workforce. They maintained their roles as mine supervisors and mill operators, while increasing their role in quartz mining. The percent decrease that offset the Californian increase was in the ranks of foreign born.
<table>
<thead>
<tr>
<th>Occupation</th>
<th>1880</th>
<th>1900</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2.10</td>
<td>2.42</td>
</tr>
<tr>
<td>Mining</td>
<td>1.91</td>
<td>2.29</td>
</tr>
<tr>
<td>Agriculture</td>
<td>2.36</td>
<td>2.30</td>
</tr>
<tr>
<td>Labor</td>
<td>1.51</td>
<td>1.78</td>
</tr>
<tr>
<td>Transport</td>
<td>2.07</td>
<td>2.30</td>
</tr>
<tr>
<td>Lumber</td>
<td>2.09</td>
<td>2.30</td>
</tr>
<tr>
<td>Other</td>
<td>1.96</td>
<td>2.36</td>
</tr>
<tr>
<td>Number Undetermined</td>
<td>3564</td>
<td>3541</td>
</tr>
</tbody>
</table>

*Estimated from 20 Percent Sample
Their proportion of the mining workforce dropped from 60 to 45 percent.

The departure of Chinese miners accounted for much of the decrease. More than 2400 of the 4400 miners missing in 1900 were Chinese. Two statewide processes forced this emigration. Repeated legal efforts to restrict and eventually oust the Chinese resulted finally in the Act of May 6, 1882, the so-called "Chinese Exclusion Act." The law suspended immigration of Chinese laborers (skilled and unskilled), including miners, for ten years and prohibited naturalization of Chinese already in the United States. Subsequent acts reinforced and extended these provisions into the twentieth century (Chinn 1969; 26-27). After immigration was stopped, death and the continued return of Chinese to China gradually depleted their ranks.

Equally significant to the Central Mines and other non-urban places were statewide riots that followed the huge Chinese immigration of the late 1870s. Murders in Los Angeles and other cities and harassment everywhere had the effect of driving the Chinese to the comparative safety of urban Chinatowns where the majority remain (Chiu 1963; 21). Chinese continued to live and work in the foothills area, but their numbers decreased by more than two-thirds in twenty years. Those remaining carried on many occupations in which mining played an equal but no longer dominant role.

In summary, the detrimental effects of the Sawyer decision and continued decline of the placer mining industry,
coupled with advances and expansion in quartz mining, caused the population dependent on mining to concentrate around successful quartz operations. Forced emigration of Chinese led a marked decline in the proportion of foreign born miners, but the offspring of earlier Cornish, Welsh and Irish miners partially compensated. By 1900, a highly dominant quartz mining industry, restricted to a few successful sites and a thin line of secondary places, still controlled and staffed by Cornish and their dependents led the vestigial gold industry into the twentieth century.

**Agricultural Population**

The number of farmers and farm workers increased 15 percent adding 575 men to the 1880 total. This small increase is noteworthy when compared to the 50 percent increase in number of farms in the Central Mines counties. Also, the additional agricultural workers were concentrated spatially. The number of farmers in most areas stayed about the same except for some losses among traditional farming townships such as Ione and White Oak, and a great increase in western Placer County. The declines in these Amador and El Dorado units were partially due to the failures of grapes as a cash crop and to opportunities presented by other areas. The increase in Placer County occurred in townships 2, 3, 4, and 9, the area of small,
rich farms, great acreage and production increases.

Both of these patterns can be explained by the virtual disappearance of two classes of agricultural workers. Gardeners, particularly Chinese vegetable growers who supplied mines, had formed a significant portion of the earlier agricultural workforce. They usually owned little or no land and were an element of the gold rush period supply system. With the many changes in marketing, production, and land alienation, farming advanced to a more stable, complex, and professional posture. Agricultural workers in 1900 consisted mainly of farmers and their hired hands.

Land alienation and the creation of national forests, by removing the open, uncontrolled range, spelled the end for the landless herdsman. Livestock became confined to farms, feeding on hay and other locally grown feeds. The removal of gardeners and herders from the agricultural employment sector explains why there were nearly twice as many new farms in 1900 as there were additional farm workers.

The proportions of various foreign born farm workers and Americans remained stable despite the decrease of foreign-dominated gardening. The only significant change was the great increase of those born in California, as occurred in every occupational class. In 1900, Californians formed 31 percent of the total, while other Americans and foreign born equally divided the remainder.
Service and Other Workers

The number of service employees declined 19 percent from 6005 to 4855 during the last two decades of the century. Concentration of service workers in large towns continued. The ratio of total population to service workers in the seven townships containing Jackson, Sutter Creek, Placerville, Auburn, Dutch Flat, Grass Valley, and Nevada City increased only slightly from 1880 to 1900 (Table 9-3). By 1900, Placer 9 could be added to the list of urban townships with its growing agricultural service centers of Rocklin, Loomis, and Newcastle. The boom in agriculture had moved Placer 9 steadily toward a population similar to the transport and quartz townships to the east. In contrast to these mild adjustments, the remaining 22 townships contained far more people per service worker, showing the further effects of mining declines and the successful competition for residents and workers exerted by the large amenity centers.

<table>
<thead>
<tr>
<th>TABLE 9-3: Ratio of Total Population to Other Workers 1880 To 1900</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Seven Urban Townships</td>
</tr>
<tr>
<td>Placer 9</td>
</tr>
<tr>
<td>Other Townships</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Like mining and agriculture, the dependent to worker ratio was very high, measured at 2.36 for 1900. The majority
of the dependents inhabited large towns further clustering people and adding fuel in the form of customers to service employment in those places.

California-born workers also moved into this occupational class and assumed many of the government and professional positions. According to the sample of the 1900 manuscript census, more than half the lawyers, government officials, and doctors were born in the state. Considering the commonness of Californians engaged as laborers, placer miners, and farm workers, this educational dichotomy is noteworthy. Perhaps, older experienced professionals chose to migrate to more promising economic areas leaving openings for young locals initiating their careers. In any case, California born formed 35 percent of this class of worker, while Americans amounted to 34 percent and foreign born 31 percent. As in 1880, foreign born were distributed in the same patterns as their ethnic counterparts in other occupations.

**Labor, Lumber, and Transport Workers**

Each of these occupational classes accounted for a small segment of the work force and population, but each further evinced the region's adaptation to new methods of land use and associated spatial changes. The number of laborers declined by 35 percent, a magnitude exceeded only by mining. The changes continued to be highly erratic spatially, but most laborers located in townships with big towns and high
Lumbering showed a modest increase of 21 percent. A drop in the number of shake and shingle makers and fuel-wood choppers offset a larger aggregation of professional woodmen. These full-time amateur mine suppliers began to disappear with mine and mill conversion to water power and the great increase of private, forested farmland. The rapid assumption of wood-cutting by professionals is evident from the spatial pattern of lumber employees. All townships along the lower elevations, where woodcutters and charcoal markers worked in 1880, lost lumberers. Those along the middle elevation coniferous forest zone increased, particularly Georgetown, Washington, and Placer 7.

The number of transport workers declined by 17 percent during the two decades. At least part of the reason was that the Central Pacific Line required less workers strung along the route at less amenable locations. As a result, many workers moved from Placer 4 to the lower elevations. In 1880, Placer 4 and Placer 9 recorded 201 and 143 transport workers respectively. In 1900, the figures were 119 and 201 for the same townships. In addition, Roseville and other towns to the west of the study area claimed many railroad employees. Grass Valley, Nevada, and other townships with large settlements continued to share the majority of transport workers with the railroad townships.

Dependence on these three activities trailed mining, farming, and services and accounted for only 14 percent of
population, almost precisely the same portion as in 1880 (see Table 9-4). As in the case of other economic functions, most unemployed dependents, even for lumbering, lived in the larger towns. California born employees made inroads in the demographic profile of all three occupational classes. By 1900, they numbered nearly one-third of the lumbermen and continued to dominate laboring and transport with 44 and 49 percent shares respectively. The proportion of Americans to foreign born remained close for all three with a slight edge going to foreign born in laboring and Americans in transport.

**Total Population Changes**

The processes affecting each occupational class combined to hold the population total at a level belying the system's economic setbacks. In the closing years of the century, mining lost more of its numerical and spatial dominance, but greater employment in other sectors and an increase of unemployed dependents further buoyed the numbers of employed males and total population. The number of workers dropped by 5606 or 22 percent from 1880 to 1900. Seventy-one percent of this loss was accounted for by the decline in employed miners. Agriculture continued to make the most rapid strides in population support.

The number of unemployed dependents remained relatively stable despite the loss of nearly one quarter of the
<table>
<thead>
<tr>
<th></th>
<th>1880</th>
<th></th>
<th>1900</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Percent Of Workers</td>
<td>Percent Of Dependents</td>
<td>Percent Of Workers</td>
<td>Percent Of Dependents</td>
</tr>
<tr>
<td>Mining</td>
<td>43.3</td>
<td>39.4</td>
<td>35.4</td>
<td>33.4</td>
</tr>
<tr>
<td>Agriculture</td>
<td>15.3</td>
<td>17.1</td>
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</tr>
<tr>
<td>Labor</td>
<td>11.0</td>
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<td>Transport</td>
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<td>4.7</td>
<td>4.5</td>
</tr>
<tr>
<td>Lumbering</td>
<td>2.2</td>
<td>2.2</td>
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<td>2.8</td>
</tr>
<tr>
<td>Other</td>
<td>23.9</td>
<td>22.3</td>
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<td>Undetermined</td>
<td>6.7</td>
<td></td>
<td>7.5</td>
<td></td>
</tr>
</tbody>
</table>

* Estimated From 20 Percent Sample
employed males. This factor ameliorated the impact of problems in the employment sector and held the total population at 47,266, only 10.6 percent less than in 1880.

These population changes emphasized earlier patterns of spatial variance. Eight townships increased population (Map 9-2) including two quartz centers, three Placer County agricultural units, one drift mining area (Placer 6) and two El Dorado County townships. The latter were both unusual because there is no evidence of notable success in any form of land use. In fact, Mountain Township actually lost a fourth of its workers, but recorded a high number of unemployed dependents. Population decrease was most severe in the hydraulic mining areas but occurred also in other areas with limited agricultural and mineral resources. The most significant spatial trend was a continuing increase in concentration of workers and people around ever more limited resources and large towns. In 1880, the townships containing Jackson, Sutter Creek, Placerville, Nevada City, Grass Valley, Auburn and Rocklin contained 46 percent of the region's people. In 1900 nearly 57 percent inhabited those townships.

A new generation of people, led by those born in California and without the Chinese placer miner, staffed each occupation. Foreign born still numbered more than one-third of the workforce but their numbers were slowly eroded by new Americans from within and without the Golden State. The changes within mining itself were chiefly
MAP 9-2: TOTAL POPULATION CHANGE 1880 - 1900 (BY TOWNSHIP)
responsible for this belated Americanization of the former mining frontier (Table 9-5).

Gold mining still played a heavy role in the economic and demographic patterns of the Central Mines. Four of the six townships with increased workforces also contained more miners. Conversely, 22 of the 24 townships that lost miners decreased total employment as well. Only the transport and agricultural zone of southwest Placer County had fully freed itself from the erratic fortunes of gold mining. But, it was with decaying influence that mining met the new century. Where it had led or tied in employment for 24 townships two decades earlier, mining held but 17 in 1890. Agriculture dominated eleven townships (Map 9-3). Two others, astride the major transport routes, depended upon employment in services. Slowly the geographical control of the foothills, blanketed so thoroughly during the days of placering, was being wrenched from the grasp of the founding industry.

At the end of the nineteenth century, the old days of excitement and laissez-faire enthusiasm for the local miner were gone. The land use system that had built the region supported barely one-third of the dependents. The carrying capacity of the land was propped up by a combination of alternate employment functions and a more balanced demographic profile. Sedentary families, relying on permanent, stable occupations replaced the wandering placer miner. The total population shrank by 21 percent from 1860
<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>1880</th>
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</tr>
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<tbody>
<tr>
<td>Mine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American</td>
<td>23.9</td>
<td>21.9</td>
</tr>
<tr>
<td>California</td>
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<td>33.1</td>
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<tr>
<td>Foreign</td>
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<td>Agriculture</td>
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<td>Foreign</td>
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<td>30.7</td>
</tr>
<tr>
<td>Transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American</td>
<td>46.9</td>
<td>28.4</td>
</tr>
<tr>
<td>California</td>
<td>22.6</td>
<td>48.7</td>
</tr>
<tr>
<td>Foreign</td>
<td>30.5</td>
<td>22.9</td>
</tr>
<tr>
<td>Lumber</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American</td>
<td>44.9</td>
<td>33.8</td>
</tr>
<tr>
<td>California</td>
<td>5.3</td>
<td>31.1</td>
</tr>
<tr>
<td>Foreign</td>
<td>49.8</td>
<td>35.1</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American</td>
<td>44.9</td>
<td>33.9</td>
</tr>
<tr>
<td>California</td>
<td>10.9</td>
<td>35.0</td>
</tr>
<tr>
<td>Foreign</td>
<td>44.2</td>
<td>31.1</td>
</tr>
<tr>
<td>Total</td>
<td>34.9</td>
<td>28.8</td>
</tr>
<tr>
<td></td>
<td>28.8</td>
<td>34.8</td>
</tr>
<tr>
<td></td>
<td>54.2</td>
<td>36.4</td>
</tr>
</tbody>
</table>

*Estimated From 20 Percent Sample
MAP 9-3: PERCENT ENGAGED IN DOMINANT INDUSTRY 1900
(BY TOWNSHIP)

M = Mining dominant  A = Agriculture dominant  O = Other dominant
to 1900. But at the end of the same period, more than half the workers were gone and three of every four miners had died, moved on, or given up their gold seeking.

**Settlement Patterns**

The land use and population changes before the end of the century were reflected in the altered distribution and size of the towns in the Central Mines. Population dispersed into popular agricultural zones and diminished substantially along all Tertiary deposits except where profitable lumbering was possible. Three significant changes befell the settlement in the foothills area. First, towns that depended on hydraulic mining decayed and some disappeared. A comparison of Map 9-4, showing the settlement network for 1895, with that of Map 7-3 (p. 283) for 1880 illustrates the decline in number and size of these towns. Especially affected were the camps along San Juan Ridge in Nevada County and in eastern Placer County. Missing were such famous hydraulic centers as Little York, Cherokee, and Wisconsin Hill, while others like North Bloomfield were shadows of their former development.

The fate of Gold Run in Placer 4 township provides a good example of the effect of Judge Sawyer's decision on the Tertiary gravel towns. Miners founded the town in 1861 and its future seemed assured when new hydraulic mines
MAP 9-4: TOWNS OF THE CENTRAL MINES, 1895

- > 1000
- 501 - 1000
- 101 - 500
- 100 OR LESS

- NEVADA CO.
- PLACER CO.
- ELDORADO CO.
- AMADOR CO.

Scale: 0 5 10 15 20 miles
opened in 1865. During the 1870s, Gold Run grew in population and importance, sporting its own "Nob Hill" wealthy residential district, nine saloons, and many other urban functions and amenities. The enjoinment of hydraulic mining was a shattering blow, however, and decay began immediately after the news arrived. Emigration and business shutdowns came one after another. A railroad depot and fuel station, built on the northern edge of the old town, eventually caused the post office, hotel and remaining stores to move to it, leaving the old site to dwindle further. Placer County historian, Lardner (1924; 171), succinctly reported, "the town died quietly when its main industry, hydraulic mining was stopped."

A number of new towns appeared, based on other resources and functions (Map 9-5). The addition of these towns overcame the loss of some hydraulic centers and increased the total Central Mines towns from 82 to 95. The geographical pattern of new towns indicates the strength of agriculture, lumbering, and a few new functions. The western portions of each of the four counties contained new agricultural centers. Towns such as Bowman and Weimar were particularly fortunate by being situated along the transcontinental railroad leading to nationwide markets. Others, such as Green Valley, Rescue, Ranlett and Richey, also depended on increased farming and the supply and transport functions it demanded.
MAP 9-5: TOWNS FOUNDED BETWEEN 1880 AND 1895

- Anthony House
- Fernley
- Gaston
- Maybert
- Chicago
- Weimar
- Bowman
- Cool
- Green Valley
- Rescue
- Pinogrande
- Fyffe
- Pacific
- Newton
- Pleasant Valley
- Carbondale
- Ranlett
- Richey
- Defender
- Electra

Legend:
- 0 5 10 15 20 miles
New towns formed along transport links further east, amid the general decline of hydraulic centers and lumbering regions. Electra, on the Mokelumne River, was home for the crew of a new dam and electric plant. Fyffe and Pacific grew along a southern extension of the Placerville Wagon Road. Shadyrun was yet another depot on the Central Pacific Line. Pinogrande and Maybert furnished lumbermen with supplies, amusements, and homes. Each of these towns and the new agricultural centers was testimony to the slipping power of mining as a regional population support and as an extensive land use system.

The divergent trends of expanded farming and more concentrated mining resulted in a town size average lower than in 1880, despite marked growth of large established towns. New towns generally contained fewer than 100 people. The average value of all towns according to population category (see Chapter 7) for the year 1895 was 1.86, down slightly from the 1880 figure of 2.09. The retreat of mining to one form, however, plus the advance of transport functions in this now remote portion of the state, led to notable growth of the major towns. Below are available figures for four of the region's principal settlements showing change from 1890 to 1900. Only Rocklin lacked substantial growth in the decade owing to large increases in its proximate neighbors, Newcastle, and Loomis. Other large towns also held substantial portions
<table>
<thead>
<tr>
<th>Town</th>
<th>1890</th>
<th>1900</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auburn</td>
<td>1595</td>
<td>2050</td>
</tr>
<tr>
<td>Nevada City</td>
<td>2524</td>
<td>3250</td>
</tr>
<tr>
<td>Placerville</td>
<td>1690</td>
<td>1748</td>
</tr>
<tr>
<td>Rocklin</td>
<td>1056</td>
<td>1050</td>
</tr>
</tbody>
</table>

of the population. Grass Valley, the largest, had nearly 5,000 people in 1900. Based on new resources and economic functions, the settlement trends of the period 1860 to 1880 were modestly reversed, therefore in the closing decades of the century. A trend toward large central towns depending on a combination of functions, plus a dispersed pattern of settlements based on farming, transport, and lumbering occurred. After forty years of evolution, the Central Mines man-land system had substantially altered its demographic and settlement character away from over dependence on mining. The influence of gold mining slowly eroded, spatially and occupationally. Beset with legal, social, and resource problems, gold mining was a troubled but still important industry in the Central Mines region. In the last chapter, we will analyze the final decline of gold mining as a major employment and land use form and the success of these alternate functions in maintaining the population of the former gold rush region.
CHAPTER 10
THE FINAL YEARS

During the first two decades of the twentieth century, the final adjustments were made to release the Central Mines region from its umbilical ties to gold mining. The industry persisted until World War II when the federal government halted all forms of gold extraction. But no longer did the region or any large subsection of it depend on mining for survival. For more than forty years after the Comstock discovery, a combination of processes had gradually weaned the system from dependence on this short-lived function with its inflated employment level. Agriculture had progressed steadily, assuming an ever greater share of population support. Lumbering and transport industries had slowly adapted, setting the scene for rapid twentieth century advances that would carry the area for decades to come. The transcontinental railroad in particular lifted most of Placer County out of an introspective, limited, and eventually doomed gold extraction system and propelled it into the larger scale, national agricultural system.

Population and settlement patterns had responded accordingly. Total population had declined, but also balanced demographically. Slowly the proportion of foreign born workers, mainly from mining, had decreased, to be replaced by American born. Locals had come to dominate many
activities including professions. Desire for amenities and a decrease in resource sites had drawn population of all occupational classes from the hinterlands and either intensified preexisting settlements or redistributed people among new agriculture, lumber, and transport centers. Gradually the system changed from one with a dispersed population in numerous camps working a widely distributed resource to one with a smaller population, clustered around towns with spatially focused but more diverse economic functions. Even agriculture had concentrated along several transport and lowland strips and in small clusters elsewhere reflecting the paucity of workable land and necessity for transport.

In 1920, the population reached its lowest total for any time from 1850 to the present. Gold mining suffered its final decline from 1900 to 1920 and retreated to an activity of considerable historical but little financial significance. Agriculture faced new opportunities and new challenges from within and without the region. In the end, despite many years of growth, farming did not inherit the role of regional population support. Instead, it fell to a group of functions that had also laid foundations in the nineteenth century, but that depended on external inventions, markets, and attitudinal changes to achieve significant growth. The modern era came to the mining country, and carried the region into the 1920s with new
hope and economic vigor.

**Mining**

The new century opened with revived optimism in the gold mining industry. The setback caused by the Sawyer decision had been accepted and partially overcome by the installment of expensive debris dams allowing new hydraulic operations and greatly increased drift mining. In the Central Valley, dredging reaped rich rewards from the old tailings.

Quartz mining, meanwhile, steadily improved in efficiency and production. New advances in mining technology and skill enabled miners to locate new gold sources and maintain adequate production. Perhaps the most significant new improvement was based on advanced knowledge of geology. In 1911, the *Pacific Miner* (p. 363) reported that geologists could finally trace gold-bearing ledges displaced eons before by faulting. This resulted in the reopening of several formerly profitable mines. In addition to this valuable knowledge, shafts were sunk deeper than ever, extending down in a few cases more than 4000 feet. The requirements in pumping, ventilation, power, and equipment were ever more difficult to manage, but rich ores made these workings feasible in selected locations. Finally, constant improvements in air drills and other equipment increased efficiency and lowered the labor requirements
in deep mines.

Despite these technological and managerial improvements, a combination of long forestalled elements of reckoning finally caught up with the region's initial industry. Although their full effects were not felt until the onset of World War I, knowledgeable mine operators and owners foresaw several major problems shortly after the turn of the century. Each involved cost increases and, with gold fixed in value, each slowly eroded the industry, starting with low-grade and marginal producers and working up through small mines, financially troubled companies, and areas of poor gold density.

The greatest problem encountered by the mines was the combination of inexorably increasing supply costs and a gold price fixed at 20.67 dollars per ounce. As late as 1915, the *Mining and Scientific Press* reported that costs for supplies still compared favorably with those of 1869 (Rickard 1916; 236-237). However, these costs were measured by unit of weight or volume. Miners in the later years worked lower grade ore so that supply costs per unit of gold obtained had increased substantially. Increased efficiency and economies of scale had partially offset this supply cost.

With the beginning of World War I, however, prices for supplies rose 18 percent from 1916 to 1917 alone. The effect of wartime demands for all forms of supplies can be
gauged from a Canadian example (Table 10-1) (Mining and Scientific Press 1916; 911). Although the wartime demand had readjusted by 1919, the prices for many supplies remained high and construction and industrial demand continued to inflate them.

Added to the high costs for steel, timber, powder, and other critical supplies, was an increased cost and decreased supply of labor. Skilled workers left the mines to serve the country in the armed forces or, more often, to obtain better wages in urban wartime industries. Even copper mining near Mt. Shasta drew gold miners away to supply the war resource. Skilled labor returned by 1919, but wages remained high due to competition from urban centers. Employers also complained that labor was less efficient than in the pre-war years. Added to these problems was a reduction in the length of a miner's daily shift from ten or twelve hours to only eight (Ibid. 1920; 91-92).

The war and competition inhibited provision of supplies. A shortage of electric power forced discrimination in the distribution of energy. Among the first consumers to suffer cutbacks were gold mines and mills. They were regarded as non-essential to the war effort and undeserving of adequate electricity for their newly converted hoists and mills. Mining companies also encountered problems with transport of their supplies. The few railroads and the remaining wagon transport network were burdened with moving food, lumber, and other products for
TABLE 10-1: INCREASE IN COST OF MINE SUPPLIES, 1914-1916*

**Mine Supplies**

<table>
<thead>
<tr>
<th>Material and Unit.</th>
<th>Price August 1914</th>
<th>Price March 1916</th>
<th>Advance %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecting wire, lb.</td>
<td>$ 0.50</td>
<td>$ 0.70</td>
<td>40</td>
</tr>
<tr>
<td>Dynamite (50%), cwt.</td>
<td>14.60</td>
<td>22.45</td>
<td>53</td>
</tr>
<tr>
<td>Detonators, 1000</td>
<td>12.60</td>
<td>39.70</td>
<td>215</td>
</tr>
<tr>
<td>Fuse (time), 1000</td>
<td>5.40</td>
<td>10.25</td>
<td>90</td>
</tr>
<tr>
<td>Rails, ton</td>
<td>43.00</td>
<td>57.50</td>
<td>33</td>
</tr>
<tr>
<td>Shovels, doz.</td>
<td>7.60</td>
<td>9.00</td>
<td>18</td>
</tr>
<tr>
<td>Steel (drill), lb.</td>
<td>0.07</td>
<td>0.09</td>
<td>30</td>
</tr>
<tr>
<td>Track-spikes, keg</td>
<td>3.25</td>
<td>4.50</td>
<td>39</td>
</tr>
<tr>
<td>Track-bolts, keg</td>
<td>6.00</td>
<td>9.00</td>
<td>50</td>
</tr>
</tbody>
</table>

**Mill Supplies**

<table>
<thead>
<tr>
<th>Material and Unit.</th>
<th>Price August 1914</th>
<th>Price March 1916</th>
<th>Advance %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borax, lb.</td>
<td>$ 0.12</td>
<td>$ 0.17</td>
<td>47</td>
</tr>
<tr>
<td>Cyanide, lb.</td>
<td>0.15</td>
<td>0.16</td>
<td>7</td>
</tr>
<tr>
<td>Crucibles</td>
<td>0.08</td>
<td>0.13</td>
<td>74</td>
</tr>
<tr>
<td>Cam-shafts, each</td>
<td>83.00</td>
<td>90.00</td>
<td>9</td>
</tr>
<tr>
<td>Cams, each</td>
<td>20.26</td>
<td>23.20</td>
<td>15</td>
</tr>
<tr>
<td>Lead, acetate, cwt.</td>
<td>8.10</td>
<td>14.30</td>
<td>75</td>
</tr>
<tr>
<td>Lead (pig), cwt.</td>
<td>5.65</td>
<td>10.06</td>
<td>78</td>
</tr>
<tr>
<td>Muriatic acid, cwt.</td>
<td>1.70</td>
<td>2.93</td>
<td>80</td>
</tr>
<tr>
<td>Pebbles (Danish), ton</td>
<td>22.03</td>
<td>26.80</td>
<td>22</td>
</tr>
<tr>
<td>Shoes and dies, cwt.</td>
<td>4.85</td>
<td>6.55</td>
<td>37</td>
</tr>
<tr>
<td>Zinc-dust, lb.</td>
<td>0.06</td>
<td>0.27</td>
<td>427</td>
</tr>
<tr>
<td>Zinc, spelter, cwt.</td>
<td>6.48</td>
<td>17.25</td>
<td>276</td>
</tr>
</tbody>
</table>

**General**

<table>
<thead>
<tr>
<th>Material and Unit.</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machinery and parts</td>
<td>10 to 40</td>
</tr>
<tr>
<td>Electrical equipment</td>
<td>20 to 50</td>
</tr>
<tr>
<td>Corrugated iron</td>
<td>50</td>
</tr>
<tr>
<td>Iron and soft steel</td>
<td>50</td>
</tr>
<tr>
<td>Tool-steel</td>
<td>500</td>
</tr>
<tr>
<td>Pipe</td>
<td>60</td>
</tr>
<tr>
<td>Fuel-oil</td>
<td>51</td>
</tr>
<tr>
<td>Gasoline</td>
<td>65</td>
</tr>
</tbody>
</table>

the urban centers, the gigantic lowland agricultural industry and the burgeoning war effort.

Vigorous enforcement of restrictions on mining added to the problems of increased costs and competition for supplies, labor, transport, and power. The California Debris Commission, created to monitor tailings disposal by hydraulic and other mines, worked so diligently at its task that many deep mines were forced to construct dams at considerable cost to impound the tailings from their shafts. Coming at a time when gold value was frozen and virtually all costs rising, this added burden was too much for some mines.

These deleterious influences raised the requisite content of gold per ton of ore in order to continue operations. From 1915 to 1930, the average gold per ton of ore worked increased from slightly less than four dollars to nearly seven. As all costs increased, mines that could avail themselves of richer ore were forced to do so, while lower grade mines ceased operations. This had a very damaging effect on the mediocre grade Mother Lode in particular, while Grass Valley mining companies consolidated and hoped to weather this latest and most serious storm (Joslin 1945; 128-135).

These negative factors led to substantial declines in the remaining forms of gold mining. Between 1915 and 1920, the value of gold produced in the four counties dropped 41 percent (State Geological Survey). The number of successful
mines also rapidly dwindled, often by merger. In 1914, the Mining and Scientific Press (p. 367) reported 318 producing quartz mines for the state of California, compared to only 99 reported in 1920 by the U.S. Census. Many of the few remaining placer miners relinquished their claims and sought opportunity in the mines of Arizona, Alaska, and Montana, the burgeoning industry or agriculture to the west, or one of the new economic activities arising in the Gold Country. In 1971, El Dorado County reported that 289 claims on federal land were maintained by proof of 100 dollars in gold production. Only three years later, a mere 34 claims were filed. Even the richest and most successful gold county in the state, Nevada County, dropped from 880 claims to less than 600 in the same period. Everywhere, in every form, gold mining suffered a large and costly retreat, leaving the Central Mines essentially bereft in all but a few isolated and fortunate locations of the industry that had built and carried the region for nearly three quarters of a century.

Agriculture

Agriculture in the Central Mines was well developed and increasingly independent at the beginning of the twentieth century. After recovery from Comstock-related population losses, expansion in area and production had steadily accrued. Firmly established external markets
aided a fruit industry of substantial statewide importance. Particularly blessed was Placer County, which relied on railroad links to both the west and east.

Agriculture was the established and natural successor to the role of economic leadership when the new century brought a final great decline in mining.

However, two factors limited the effectiveness of farming and impeded further growth. First, local demand fell sharply with emigration of the mining population and associated service workers and dependents. Second, vigorous external competition for distant markets increased due to successful statewide efforts to create agricultural cooperatives and control refrigerator car rates. The California Fruit Exchange, formed in 1901, was the first successful marketing organization for deciduous fruit in the state (Erdman 1958; 179-183). While it experienced problems in recruiting local units, it established the trend for successful cooperation in marketing, bargaining with buyers and shippers, and avoidance of overproduction.

Rate reductions for refrigerator car shipments of fruit began in 1906. One of the principal successes of the cooperatives, it was aided by competition among railroads. These changes and the establishment of "pre-cooling" plants to ensure maximum protection of the fruit, aided statewide production and marketing (Powell 1910; 413-415). Production of every orchard commodity in the state increased
dramatically. Central Valley and coastal farms, with better and more extensive lands, benefitted the most. Fruit production in the Central Mines expanded but its rate was slowed due to this intense competition.

Another problem for Central Mines farming was the declining availability of land for further expansion. Agriculture had approached the limit of cultivable land in the region. Intensification of production could still occur, but extensive areal expansion of crops was checked in most areas by rugged terrain, national forests, and increasingly valuable alternate land uses. Though agriculture in 1920 supported the greatest proportion of the population, like mining it had reached the limits of its capabilities. Although it did not subsequently collapse as did mining, neither did it boom as its promoters had hoped.

Several changes in agriculture resulted from these factors. The number of farms operating in the traditional mining zones dropped substantially. A diminished local market caused problems for farmers with limited distribution networks. El Dorado and Amador counties declined most severely. This decline was offset by a considerable concentration of new farms in western Placer and southern Nevada counties where access to rail transport was assured (Map 10-1). In addition, new farmland developed in the higher elevations to serve local lumber and recreation
MAP 10-1: NEW LANDS PATENTED 1900-1920

one dot = 500 acres

NO DATA

0 5 10 15 20 miles
markets.

New types of farms and an increasing regional divergence in cropping also developed (Table 10-2). A late-coming cash crop rose to preeminence, as all four counties adopted pears. Peaches from the Central Valley cut into the market for this former leader. Fruit growing in less accessible areas declined. Production of all fruits in Amador County and all but pears in El Dorado and Nevada counties were badly affected. Only Placer County, with 79 percent of all Central Mines orchard trees in 1920, continued to share the state's uninhibited growth.

Farms in Amador, El Dorado, and Nevada counties, with decreasing numbers and limited eastward expansion, experienced great increases in farm size and a return to the long dormant livestock industry. Intensive, diversified farming, of the type so long sought by promoters and county officials, required superior distribution systems for external marketing. With this feature absent or underdeveloped in most parts of these three counties and with local population decreasing, remaining farmers purchased the lands of their failing neighbors and adopted a more extensive, low capital and labor input agricultural system. A trend toward small, irrigated farms reinforced Placer County's distinctiveness. The railroad had removed Placer County from the stumbling local economy. At no time was the effect of this important geographical change more evident than in the contrast of county agricultural profiles in
TABLE 10-2: AGRICULTURAL STATISTICS FOR THE CENTRAL MINES, 1900-1920

<table>
<thead>
<tr>
<th></th>
<th>Amador</th>
<th>El Dorado</th>
<th>Nevada</th>
<th>Placer</th>
<th>Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Farms</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>560</td>
<td>759</td>
<td>522</td>
<td>1,076</td>
<td>2,917</td>
</tr>
<tr>
<td>1920</td>
<td>479</td>
<td>729</td>
<td>481</td>
<td>1,280</td>
<td>2,969</td>
</tr>
<tr>
<td><strong>Average Size</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>382</td>
<td>276</td>
<td>231</td>
<td>409</td>
<td>337</td>
</tr>
<tr>
<td>1920</td>
<td>652</td>
<td>330</td>
<td>413</td>
<td>182</td>
<td>331</td>
</tr>
<tr>
<td><strong>'50 Acres</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>50</td>
<td>110</td>
<td>127</td>
<td>412</td>
<td>699</td>
</tr>
<tr>
<td>1920</td>
<td>70</td>
<td>140</td>
<td>135</td>
<td>616</td>
<td>961</td>
</tr>
<tr>
<td><strong>50-100 Acres</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>60</td>
<td>96</td>
<td>64</td>
<td>196</td>
<td>416</td>
</tr>
<tr>
<td>1920</td>
<td>50</td>
<td>98</td>
<td>69</td>
<td>267</td>
<td>484</td>
</tr>
<tr>
<td><strong>100-500 Acres</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>381</td>
<td>466</td>
<td>274</td>
<td>382</td>
<td>1,503</td>
</tr>
<tr>
<td>1920</td>
<td>261</td>
<td>378</td>
<td>205</td>
<td>320</td>
<td>1,164</td>
</tr>
<tr>
<td><strong>&gt;500 Acres</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>69</td>
<td>87</td>
<td>57</td>
<td>86</td>
<td>299</td>
</tr>
<tr>
<td>1920</td>
<td>98</td>
<td>113</td>
<td>72</td>
<td>77</td>
<td>360</td>
</tr>
<tr>
<td><strong>Cattle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>15,907</td>
<td>10,681</td>
<td>7,288</td>
<td>6,602</td>
<td>40,478</td>
</tr>
<tr>
<td>1920</td>
<td>19,825</td>
<td>16,087</td>
<td>9,937</td>
<td>8,244</td>
<td>54,093</td>
</tr>
<tr>
<td><strong>Sheep</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>4,127</td>
<td>3,229</td>
<td>3,142</td>
<td>32,432</td>
<td>42,930</td>
</tr>
<tr>
<td>1920</td>
<td>9,981</td>
<td>10,985</td>
<td>11,472</td>
<td>23,848</td>
<td>56,286</td>
</tr>
<tr>
<td><strong>Value Livestock</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>510,890</td>
<td>361,894</td>
<td>280,030</td>
<td>487,351</td>
<td>1,640,165</td>
</tr>
<tr>
<td>1920</td>
<td>1,248,462</td>
<td>1,129,426</td>
<td>712,726</td>
<td>1,162,660</td>
<td>4,253,274</td>
</tr>
<tr>
<td><strong>Peach Trees</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>19,819</td>
<td>91,851</td>
<td>25,232</td>
<td>681,578</td>
<td>818,480</td>
</tr>
<tr>
<td>1920</td>
<td>18,832</td>
<td>56,005</td>
<td>17,009</td>
<td>860,301</td>
<td>952,147</td>
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(Table 10-2 continued on next page)
### TABLE 10-2: AGRICULTURAL STATISTICS FOR THE CENTRAL MINES, 1900-1920 CONTINUED

<table>
<thead>
<tr>
<th></th>
<th>Amador</th>
<th>El Dorado</th>
<th>Nevada</th>
<th>Placer</th>
<th>Study Area</th>
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<tbody>
<tr>
<td>Pear Trees 1900</td>
<td>6,364</td>
<td>52,311</td>
<td>38,923</td>
<td>146,891</td>
<td>244,489</td>
</tr>
<tr>
<td>1920</td>
<td>4,165</td>
<td>235,459</td>
<td>107,493</td>
<td>484,630</td>
<td>831,747</td>
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<tr>
<td>Apple Trees 1900</td>
<td>13,936</td>
<td>36,944</td>
<td>32,236</td>
<td>65,072</td>
<td>148,188</td>
</tr>
<tr>
<td>1920</td>
<td>9,196</td>
<td>31,185</td>
<td>21,508</td>
<td>42,595</td>
<td>104,484</td>
</tr>
<tr>
<td>Other Trees 1900</td>
<td>27,336</td>
<td>49,154</td>
<td>16,959</td>
<td>243,554</td>
<td>337,003</td>
</tr>
<tr>
<td>1920</td>
<td>46,384</td>
<td>69,913</td>
<td>24,833</td>
<td>1,042,241</td>
<td>1,183,371</td>
</tr>
<tr>
<td>Barley Acres 1900</td>
<td>4,406</td>
<td>401</td>
<td>224</td>
<td>5,132</td>
<td>10,163</td>
</tr>
<tr>
<td>1920</td>
<td>1,916</td>
<td>275</td>
<td>122</td>
<td>1,473</td>
<td>3,786</td>
</tr>
<tr>
<td>Wheat Acres 1900</td>
<td>3,084</td>
<td>1,235</td>
<td>274</td>
<td>31,583</td>
<td>36,176</td>
</tr>
<tr>
<td>1920</td>
<td>1,291</td>
<td>704</td>
<td>117</td>
<td>23,449</td>
<td>25,561</td>
</tr>
<tr>
<td>Grape Vines 1900</td>
<td>448,502</td>
<td>704,702</td>
<td>155,772</td>
<td>816,983</td>
<td>2,125,959</td>
</tr>
<tr>
<td>1920</td>
<td>420,239</td>
<td>182,111</td>
<td>77,641</td>
<td>1,248,098</td>
<td>1,928,089</td>
</tr>
<tr>
<td>Value Production</td>
<td>1900</td>
<td>479,830</td>
<td>543,446</td>
<td>421,769</td>
<td>1,407,737</td>
</tr>
<tr>
<td>1920</td>
<td>682,186</td>
<td>867,083</td>
<td>399,461</td>
<td>5,080,793</td>
<td>7,029,523</td>
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<tr>
<td>Percent Irrigated</td>
<td>1900*</td>
<td>24.5</td>
<td>38.9</td>
<td>54.2</td>
<td>48.1</td>
</tr>
<tr>
<td>1920</td>
<td>13.6</td>
<td>34.1</td>
<td>55.1</td>
<td>58.2</td>
<td>43.2</td>
</tr>
</tbody>
</table>

* Irrigated figures for 1900 and 1910
the early twentieth century.

New farms continued to be established but their numbers just offset those that failed during the two decades. Additional acreage resulted from increased farm size rather than new units. By the end of World War I, alienation of new lands had virtually ceased. Agriculture adjusted to stringent limits, and the healthy progress that had characterized it for forty years slowed to a trickle. From 1860 to 1900, a steady one-third of the homestead patents failed. In the last two decades covered in this study, that rate rose to 64 percent and in the final few years nearly 100 percent. The era of expansion for foothills agriculture was past. It was left to other land use functions to provide the impetus, the foundation, and the money for any new population and economic growth.

The Heirs to Mining

Through the period 1860 to 1900, two economic functions had slowly evolved the characteristics necessary to lead the Central Mines region to new prosperity. Lumbering and transport-related industries had, after initial setbacks, both achieved healthy growth based on externally supplied decisions, infrastructure, and capital. In the early decades of the twentieth century, both gained from further inputs which brought them geographical expansion and growth.
in their population support capabilities. By 1920 there were still problems to overcome, particularly in lumbering, but they were the heirs to mining in the Sierra Nevada foothills. Growth and integration of national lumber corporations at the end of the nineteenth century continued and intensified in the new century. Improvements led to expansion in the Sierra Nevada, particularly in El Dorado County and the other Central Mines counties. Land purchases, technological advances, and enlargement of mills increased the economy of scale. Vertical integration and corporate consolidation continued to lead lumbering from its haphazard, amateur past toward big business, as it had done for mining decades earlier. New, external markets demanded huge increases in cut lumber and consequent financial and employment growth. The first two decades of the new century saw lumbering come into its own in the Sierra Nevada.

The most significant improvements, affecting every step of the lumber industry, were in the transport of logs and lumber. The inefficiency and expense of wagons and flumes had long impeded local timber cutting. The problem was largely overcome by the construction or extension of several railroads for the express purpose of moving lumber. The two most important were built by large lumber companies. The Camino, Placerville and Lake Tahoe was founded in 1912 by the Tacoma based C. D. Daneher Pine Company. This
Pacific northwest firm owned 25,000 acres of timberland, produced 30,000,000 board feet of cut lumber per year, and employed 500 men. Farther south, the California Door Company built the Diamond and Caldor Railway in 1904 (Map 10-2). This giant company produced 20,000,000 board feet per year and employed 300 men. Other proximate large companies, such as the Michigan and California Lumber Company, also used these narrow gauge railroads which connected with the Southern Pacific at Placerville and provided access to the statewide market (El Dorado Expositions Committee 1914; 10).

Elsewhere in the Central Mines, mills availed themselves of established or extended rail lines. In Martell, at the terminus of the Amador Central Railroad, a large lumber yard was built to funnel Amador County's timber westward. Mills in Nevada and Placer County continued to use the Central Pacific Line. Some, like the Hobart Estate Company in Washington Township, rivaled the El Dorado County firms in size and production.

These improvements and new corporate investments brought immediate results in employment and production. Up to 20 percent of the employed males of the region may have engaged in cutting trees, sawing lumber, and moving the product of the Sierra's new leading extractive industry (Blackford 1977). Between 1899 and 1916, the annual cut of pine in California nearly doubled (May 1953; 25-33). The
MAP 10-2: RAILROADS OF THE CENTRAL MINES WITH DATES OF EARLIEST OPERATION
frailty of the region's primary economies was again revealed in World War I when problems reminiscent of both mining and agriculture affected the lumber industry. The very success of the big mills glutted the market and led to price decreases while supply costs rose with those of mining (Blackford 1977: 60-64). Again, unbridled expansion and optimism was checked by harsh realities of supply, demand, and competition. Nevertheless, the ever increasing demand from California's burgeoning population, the establishment of more distant and extensive markets, and a continued improvement in efficiency had built the requisite base for the future. As late as the 1950s, the lumber industry was the primary employer for El Dorado County and a cornerstone of the economic fortunes of all the old mining counties.

Improvements in transport had aided agriculture and, in the new century, lumbering. With the invention of the automobile, transport again provided the impetus for associated functions to expand. Two activities began a steady growth toward the roles of dominance they enjoy today. The existence of automobiles required roads and services. All four counties trailed the state in cars per capita but, as in the case of railroad routing, the Central Mines lay astride the two most accessible routes to the east on either side of Lake Tahoe. A service industry for travelers resulted.
More important was the tourist traffic enabled by cars and by changes in attitude and the general economy of the average man. Mountains and forests, by the end of the nineteenth century, were widely perceived as salubrious and enjoyable places. National parks were one of the results of this new attitude. Locally, the montane landscapes of the Central Mines were important hinterlands for the populations of Sacramento and the San Francisco Bay Area. The creation of national forests allowed recreationalists to freely use much of the middle elevations for various purposes. El Dorado National Forest recorded 175,000 recreation visitors in 1922. By 1926 this had risen to 205,000. In 1928, 28 government and 24 private land resorts existed in the El Dorado County portion of the forest. In addition, the number of summer houses on the forest land rose from 174 to 519 between 1920 and 1926. Recreation camps owned by lowland cities like Oakland, San Francisco, and Stockton competed with the private resorts for urban pleasure seekers. By 1926, revenue from recreation equalled that of all grazing and doubled that from the sale of timber (Mountain Democrat 1928; 16).

Lumbering, recreation, and service to transportation and travellers carried the region into the modern age. Mining was virtually a memory; farming was stable but weighted under the burden of valley competition. These
were the economic heirs to the gold rush, the new reasons to come to the foothills. Finally, the Central Mines had become a goal again, even if only for seasonal residents.

Population and Settlement

The collapse of mining left the burden of population support to alternate functions. However, agriculture stagnated and the new industries were unable to immediately compensate. The result was a regional population in 1920 lower than that recorded in any previous U.S. Census. From 1900 to 1920, the Central Mines population dropped 27.1 percent from 47,266 to 34,438 people. In many townships, the magnitude of decline resembled that of the immediate post-Comstock years (Map 10-3). Most severely affected were the remoter portions of Nevada and Placer counties where Tertiary gravel mining had so long prevailed. The rare exceptions to population decrease continued to persist along the major external transport links in Placer and El Dorado counties. Throughout the sixty years of adjustment, these two lifelines continued to draw people from their hinterlands and away from the failing foothills economic system.

Migration and replacement continued to characterize the Central Mines, particularly in the languishing mineral
MAP 10-3: TOTAL POPULATION CHANGE 1900-1920 (BY TOWNSHIP)
industry. The Mining and Scientific Press (1912; 279) reported that in the decade following the turn of the century Irish, English and American miners were largely displaced in Amador County's big quartz mines by Italians, Austrians, and assorted Eastern Europeans. The percentage of foreign born residents of the four counties remained constant during the two decades, but in all occupations English, Chinese, and Irish slowly drifted away to new opportunities. Japanese and southern Europeans replaced some of them.

Concentration in fewer townships and in those with large towns continued, but the incipient countetrend toward more numerous small centers also proceeded. By 1920, 61 percent of the region's residents lived in the five most populous townships while two-thirds inhabited the units containing Jackson, Sutter Creek, Placerville, Auburn, Grass Valley, Nevada City, Dutch Flat and Rocklin. However, the further degeneration of many mining towns and some agricultural centers, and the founding of new towns for lumber and transport reinforced the dispersal of population nodes initiated near the end of the nineteenth century. In 1914, there were 17 new towns, eleven of them in El Dorado County (Map 10-4). They lay principally along existing transport routes in Placer, El Dorado, and Nevada Counties and scattered among the middle elevations of El Dorado County where lumbering recorded its greatest
advances.

Eleven towns present in 1895 disappeared, including a number of young agricultural centers and a few old mining towns such as You Bet and Salmon Falls. The factors in town decline were basically the same as those outlined in Chapter Seven. Greenwood, in El Dorado County, had existed with a combination of supply functions and low grade quartz mining. Declines after the Comstock and Sawyer problems had been reversed by later nineteenth century quartz mining successes. But, the new hopes dissipated by 1916 and the town spiralled into depression and economic failure after its long tenuous existence (Davis 1973; 13-17).

Transport functions continued to support many towns, but the fickleness of this externally-controlled activity was still exhibited from time to time. The town of Rocklin, at the height of its growth was dealt a serious blow in 1906 with the move of its roundhouse and rail yard system to Roseville. Coupled with a decline in the quarries, this created population and economic stagnation amid the most successful agricultural zone in the foothills. Had it not been for locally produced pears, peaches, and berries, the town might have totally collapsed in the face of competition from its neighbor settlements (Lardner 1924; 206). Each of these factors, town by town, altered the settlement pattern of the Central Mines draw-
ing it further from the gold-based network of the early days.

Town size continued to decline with the general diminishment of population and dispersal to new small towns. The statistic gained by dividing the number of towns into the sum of points accorded by size class was 1.77 for 1914. This figure was lower than that for any earlier time. The retreat to dependence on spatially limited forms of mining had reached its maximum in 1880 and subsequent non-mining activities drew the settlement pattern into a more standard rural network thereafter.

Mining, thus, ended as a major force in the Sierra Nevada foothills. For more than seventy years the fates of the mines had been the principal input into a system characterized by overdependence and monofunctional geographical patterns. The end was graphically illustrated by the divergence of two processes after decades of correlation. Whenever gold mining had declined, in employment or production for any reason, the population had also declined. This was true in the 1860s when placer miners emigrated, in the 1880s when hydraulicking was halted, and in the early twentieth century as costs outran revenue throughout the mines. In 1920, the population descended to its lowest level. The next decade saw a modest increase which heralded a recovery that is still unabated. However, mining production continued to fall—until in 1930 it was a
mere shadow of the level recorded two decades earlier. For the first time, the Central Mines region—or perhaps the Central Sierra Nevada Counties would better name the new system—increased population in spite of mining problems. Finally, after sixty years of adjustment the economic functions, infrastructure, and impetus for growth had escaped mining. A new man-land system, with a stable but spatially concentrated fruit industry, major lumber companies, and the revenue of thousands of travelers and recreationalists, operated amidst the ghost towns, mine shafts, relicts and memories of the California gold rush.

The System in 1920

The characteristics of the Central Mines in 1920 were the antitheses of those in the 1850s. What had been economically focused was now diverse; what had been ephemeral and mobile was now, after the last great decline, fairly stable; what had been homogeneous was geographically heterogeneous. In adjusting from the overdevelopment of a mining-boom start, the man-land system had fundamentally changed nearly all its most basic qualities.

The four Sierra Nevada counties were economically diverse by 1920. Very few residents depended on placer mining and a minority, perhaps less than fifteen percent of the employed males, sought gold in any form. No alter-
nate activity dominated as had mining. A conglomerate of functions combined to maximize the slim resource base and support the smaller population. Each activity depended slightly on its co-functions, but more on the distant markets and larger scale activities and decisions of the West and the nation. Agriculture concentrated on fruit production and limited livestock raising. Both products supplied California's coastal cities and the former contributed to supply of the vast Eastern demand. Lumber mills, sent their products by rail out of the mountains to the insatiable manufacturing and construction industries of the cities. Transport services played a prominent role with the automobile and recreation luring thousands of visitors and travelers into the region.

The land now was controlled by the acts and the agency of the Federal government. Portions of two national forests ensured balanced, multiple land used for nearly half the old mining region. Patenting of land to individuals for agriculture and other uses had removed most of the remaining public domain. Neither mining nor any other local industry could usurp land for its pursuit of wealth. Water and timber resources were also increasingly protected.

Infrastructure reflected the diverse economy. National transport links and mountain passes had determined the two principal routes which the Central Pacific Railroad and
the Placerville Wagon Road followed. Subsidiary railroads carried agriculture, supplies, and lumber to and from the major arteries and the distant cities. Towns reflected the diversity of functions equally servicing agricultural, lumbering, recreation, and mining zones.

With an economy based on diverse functions, the population and settlement were stable and less mobile. Most residents had been born in the state, many in the four counties. The demographic profile represented that of the state and the family unit was well represented. Most towns present in 1920 still exist today. The largest and leading economic sites such Grass Valley, Nevada City, Auburn, Placerville, Jackson, and Sutter Creek retain those functions and roles. Few towns have disappeared. Few new towns have achieved significance.

The diverse economy and stability of these patterns marked the Central Mines with considerable heterogeneity. Each of the four counties geographically differed from the others and varied internally. Nevada County retained a modicum of mining in the big quartz center of Grass Valley. Incipient agriculture was found along the southwest while the remainder of the county languished. El Dorado county depended on small scale, diverse farming in the west and a powerful and highly developed lumber industry in the east. Amador County turned to grazing,
some lumbering, tourism, and a few mines to carry its population. Finally, rich Placer County continued to develop in the sphere of Central Valley commercial agriculture and the major trans-Sierra rail artery. Its farms were smaller, more intense and richer. Its towns, strung like beads on a railroad necklace, were assured of demand for many services. Its population was confident and ever growing.

In 1920, the former gold region, the goal for thousands in the mid-nineteenth century, was a tiny backwater in the rapid advance of California population and economy. Some chose to visit the old gold country; few chose to stay. The former mining zone now blended into the pattern of many western frontiers that had been bypassed by progress. Using a diverse resource base, they had settled down to modestly and quietly pursue lives and livelihoods amid the relicts of an era of excitement, and of impermanence.
CONCLUSION

The Central Mines region, in the heart of California's Gold Country, took some seven decades to overcome the burdensome legacy of its boom-time origin. Though the subsequent development relied heavily on the infrastructure of the initial occupants, a transformed system began growth anew after World War I. The adjustment had radically altered the nature of land use, the composition and size of the population, and the spatial network of settlement. At the end of the introduction, five questions about this complicated process of adaptation were posed. The answers to each embody the complex qualities of this geographical evolution.

How did the mining industry react?—Mining, the initial and primary industry, had built the entire system, molding its towns, roads, and socio-economic institutions to the pursuit of gold. As placer gold declined, more difficult and expensive methods of extraction advanced to compensate. Technological problems were attacked and overcome one by one. The Comstock experience, the very blow that so drastically accelerated California's placer mining decline, was instrumental in fostering these advances in other sectors. However, new setbacks continued to beleaguer the mineral industry. Copper mining fell to competition within and without the state. Hydraulicking was outlawed, a
victim of its own success. Step by step, sector by sector, mining in California retreated. Each retreat forced greater reliance on remaining methods. Finally, the last viable form, quartz mining, buckled under the burden of rising costs and a frozen gold value. It fell to the pressures of a state and a national economy that was concerned with other things.

Each retreat of gold mining concentrated the industry spatially. In the early days of placering, prospectors and panners combed every river, creek, flat, and hillside for any trace of the precious metal. A decade and a half later, all but the Chinese and a few part-timers sought gold in narrow veins and Nevada and Placer counties' Tertiary ridges, and a few other minerals elsewhere. Twenty years after that, significant mines were to be found only along a few tertiary ridges rich enough for drift mining, and atop the Mother Lode and mid-Nevada County vein systems. After 1920, only Grass Valley and southern Amador County still counted mining as a valuable local industry.

Mining held on for as long as it could, steadily losing employees, gold sources, and legal and economic methods of operation. Finally, it just cost more than it was worth.

What role did agriculture, lumbering, and transport play in preventing complete decay?--Each of the alternate functions was present in the 1850s, but only to serve mining. Nonetheless, perception of potential expansion and some
infrastructure were available for later development. Regional promoters sought diversity and, initially, it did characterize each economic function. A multiple crop base assured subsistence and adequately served the local market. A variety of individual and small companies scrambled to supply the needs for wood and charcoal products. Wagons plied the roads conveying supplies from place to place within the Central Mines region.

With the development of markets outside the region and the transport links to reach them, each function became more specialized, more intensive, and more important to the regional system. Agriculture slowly evolved a concentration on deciduous fruits along roads and rails to the east and west. Broader economic issues, such as multi-state railroads and statewide cooperatives, became the most important factors to many farmers. Coastal markets, national forests, and vertical integration of lumber corporations provided the impetus necessary for the growth of lumbering. Big company mills, sawing pine-lumber, replaced the hodge-podge of woodchoppers, shake-makers, forest-clearing farmers, and timbermen who had supplied the mines. Finally, transport, with the Comstock discovery, began to focus outward. In so doing it aided all other economic functions. The transcontinental railroad assured Placer County of a bright future. Links to the big lumber mills and rich orchards were the paths to successful adaptation. The Central Mines could only sur-
vive by ending its independent and introvertive course. It did so by becoming a minor cog in a larger economic machine.

In 1920, diversity was still the key to the future. However, it was not within each function but between them. Mining had initially overwhelmed the area. When it faltered, the entire system suffered. By the end of World War I, farming, lumbering, recreation, transport services, and even a bit of vestigial gold mining spread the responsibility of population support between them. No longer could a serious decline in one mode of a single industry deal such a staggering blow to the region.

How did the people cope with this economic decline?--With the rapid decrease in placer gold, coupled with lucrative strikes elsewhere, the vast majority of the miners emigrated. But, a combination of new immigrants pursuing other functions and thousands of women and children ameliorated the decline. In the process, trends associated with mining reversed. Although mining itself remained the province of foreigners, the percent of foreign born in the total population declined, particularly as California born inherited the occupations. The population total fell by nearly half, but the number of working males declined by more than two-thirds and the number of miners over 90 percent.
The population shifted spatially. El Dorado County dropped almost 70 percent from 1860 to 1920. Placer County fell but six percent, and that only in the last decade. People clustered in successful areas and larger towns seeking the opportunities and amenities available to sites with outside contacts. Ethnic contacts and memories of an earlier placering experience, influenced individual geographic decisions. But response to economic stimuli characterized the Central Mines.

What became of the myriad of camps and towns born of the gold rush?--The Central Mines underwent a substantial change in settlement from the middle fifties to 1920. Of the 191 towns present on the 1850s map, 75 percent were gone by the twentieth century. The greatest proportion were tiny, ephemeral placer camps that disappeared before or during the Comstock rush. Fifty-eight percent of the towns shown on the WPA map were gone by 1867. Thereafter, a slow, grinding decay erased one town after another. Many of them, such as Little York, You Bet, and Todd's Valley, had been famous centers during the rush. With a few notable exceptions, every town that disappeared during the seventy years owed its birth to the pursuit of gold.

Amid this decline, however, 45 new settlements appeared. Most were strung along the Central Pacific Railroad and scattered across El Dorado County. Each town existed for some reason other than mining. Nowhere was the stark
transformation of the system more evident than in the divergent fates that befell the many little towns and camps of the Central Mines.

As in land use and population patterns, there were elements of the mining system that persisted in settlement. Indeed, they persist today. With the single exception of Colfax, all of the large towns, political centers, and commercial nodes had established their economic and political roles before the decline began. Jackson, Sutter Creek, Placerville, Auburn, Dutch Flat, Grass Valley, and Nevada City all rose to prominence with placer gold and though beset with difficulties, never relinquished their power. A few, like Grass Valley and Sutter Creek, owed their continued success to mining. Others, like Placerville and Auburn, adjusted completely to roles as transport and service centers. These larger towns form the most important legacy of the gold rush to their modern counties.

A second persistent settlement feature is the peculiar morphology of the surviving towns. With few exceptions, each presented a convoluted street pattern that readily exhibited its origin as a streamside camp. Despite occasional half-hearted efforts during the remainder of the century and later with the construction of state highway 49, virtually no change has been made to the present. They remain as landscape testimonies to the gold rush.
How did the man-land system adjust temporally and spatially to a condition of equilibrium with the new carrying-capacity of the region?--Each change that affected mining or any other element of the system sent a reactionary ripple through the region. When placering declined, supply functions fell or shifted, people moved or changed jobs, and whole towns vanished or appeared. Later, market decisions, railroad rates, disposition of federal lands, supply costs, availability of labor, technological innovations in mining and fruit shipment, and lumber milling all prompted new changes. Distribution of mines and miners, farm size and cropping, scale of lumbering and recreation, ethnic and demographic structure of the population and its distribution continued to respond. Mining had denied agriculture and lumbering the conditions necessary to develop. As it fell to costs, legal sanctions, and disinterest, these former mine-suppliers pulled the region from excessive dependence on gold, trading it off for dependence on state and national economic trends. It was a slow process that rearranged the spatial structure of the region as it advanced.

As a result, the major features of the gold rush were reversed. In 1850, the Central Mines had been economically focused, with a transient population and ephemeral settlements, and remarkably homogeneous throughout the four counties. By 1920, it was economically diverse, contained
a stable, largely home-grown population and permanent towns, but distributed its advantages to a few discrete areas. Portions of the Central Mines optimistically pursued the future, while others dwelt in the glory of the past.

Wherever mining could persist, it did so, retaining its traditional role of economic dominance in those few sites. Wherever it could not, either new functions replaced it or the area's economic languished and its population departed. Transport, especially to external markets, was the most important factor in determining which portions of the Central Mines could survive. Changes in the patterns of land use, population, and settlement all reflected it. The inputs of the gold rush had been useful, however, in reordering the system. The major towns, the two principal trans-Sierra routes, the intricate water supply network, and a population and local government were in place by the mid-1850s. The mining boom was a difficult start to overcome, but at least it had provided the structure for further development and had settled this remote region more quickly and completely than the traditional frontier movement could have.
BIBLIOGRAPHY


Amador County. 1912. Assessment Rolls. Extant editions include 1856, 1878-1879, 1912.

________. 1907-1919. County Assessor's Reports. 40 volumes.

________. 1867-1914. Great Register.

________. 1860-1920. Minutes of the Board of Supervisors.

________. 1909-1920. Proof of Labor Claims. (Proof $100 worth of labor done on federal mining claims.)

Amador County. Board of Supervisors. 1887?. Resources of Amador County. Amador County, Board of Supervisors, Jackson, California.

________. 1899. Ordinances of the County of Amador. Board of Supervisors, Amador County, California, 86pp.

Amador County Mining Records. 1872. Includes records of dividends and expenses of Downs Mining Prospect, articles of incorporation for Lincoln Gold Mining Company, 1872, and subsequent meetings minutes, expenditures, plus employee records for Sutter and Amador Water Works and Ione Water Works, 6 vois., plus letters, documents, in folders.

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Carpenter, Gideon J. 1853-1892. Correspondence and Papers. Reporting on mining properties and law practice in El Dorado County, California.


Crockett, George H. 1854-1862. Account and Memorandum Book, Reports on Gold Mining in El Dorado County, California.


Crosley, Mary Edith. 1957. Volcano. Published by Author, 30pp.


Darlington, Abraham. 1846-1912. Correspondence and Papers. One Box, 106 volumes relating to accounts, farming and shopkeeping around Shingle Springs, plus letters concerning the soapstone business.


Doble, John. 1851-1865. Correspondence and Papers. Concerning Voyage to California, mining around Volcano and descriptions of various mining camps.


___________. 1867-1868. *Great Register.*


El Dorado County. Board of Supervisors. 1887. *Resources of El Dorado County.* Published by Fellows and Selkirk, Placerville, 208pp.

The El Dorado County Board of Trade. 1911. *El Dorado County, California,* 32pp.


Gillett, Marinos. 1862-1865. *Letters to his Cousin. Experiences mining in Sutter Creek and Placerville.*


The Great Dutch Flat Swindle. 1864. An address to the Board of Supervisors, Officers and People of San Francisco, 131pp.


"Hardrock Trail." 197?. *Guide to Empire Mine State Park, California Department of Parks and Recreation.*


Ione Board of Trade. 1901. Resources Surrounding Ione, Amador County, California. Ione Board of Trade, Amador County, California.


Kearse, George Thomas. 1850-1876. Papers. Letters and Accounts of voyage to California and mining in Amador County.


cerning mining and life in Nevada County.

Levick, M. B. Nevada County, California. Sunset Magazine Homeseekers'
Bureau, San Francisco, California, 32pp.

Lewis, O. 1934. The California Mining Towns. A series of sketch
and description folios published by The Book Club of California,
San Francisco, 12 in the series. No. 4, Auburn; No. 6, Nevada
City; No. 7, Jackson; No. 8, Grass Valley; No. 10, Placerville.

Libby, Granville M. 1852-1869. Letters to his Family in Maine.
Life in and business in Placer County.

Lindgren, Waldemar. 1896. The Gold-Quartz Value of Nevada City and
Grass Valley Districts, California. U. S. Geological Survey,
Extract from the 17th Annual Report of the Survey, 1895-1896,
Part II--Economic Geology and Hydrology.

Logan, Clarence A. 1934. Mother Lode Gold Belt of California.
California Division of Mines, Bulletin No. 108, San Francisco,
California, 240pp.

In: Olaf P. Jenkins, ed. The Mother Lode Country, California
Division of Mines and Geology, Bulletin 141, pp. 31-34.

Loosley, Allyn C. 1971. Foreign Born Population of California,
California.

Lueke, Mary, Brian Power, and Jim Rock. 1980? A Glossary of Mining
Terms, Greenwood and Associates, Pacific Palisades, California,
47pp.

THE LUMBERMAN. 1920? West Coast Directory of Lumber and Shingle
Mills. Published by West Coast Lumberman, Seattle, Washington,
52pp.

Margo, Joan. 1947. The Food Supply Problem of the California Gold
Mines, 1848-1855. Masters Thesis in History, University of
California, Berkeley, California.

MARYSVILLE APPEAL. 1878. Directory for Northern California. Lockwood
and Dawson, Publishers, Marysville, California, 428pp.

Maslin, E. W. 1884. "The Sierra Foothills--Soil and Climate and
Adaptation to Fruit and Grape Culture." Transactions of the
California State Agricultural Society. Address to the 14th Annual
Fair of the El Dorado District Agricultural Association, Grass


Menzel, Marion L. 1944. The Historical Geography of the Sheep Industry in California in the Nineteenth Century. Master's Thesis in Geography, University of California, Berkeley, California, 113pp.


The Miner. 1865-1866. Published Monthly by the California Mining Bureau Association, San Francisco, California.


Mines of the Pacific Coast. 1892. Bound collection of newspaper clippings on California Mining from the San Francisco Chronicle, May 1892.


Myers, Jackson R. 1881. "Placerville Saved." Letter to the Congress of California concerning the author's claims against the city of Placerville for non-payment of bonds issued to him in lieu of payment for labor on a railroad to Shingle Springs.


NEVADA CITY NUGGET. 1951. "100" Years of Nevada County. Special publication of the Nevada City Nugget, 136pp.


Nevada County Mining Review. 1895. Published by the Daily Morning Union, Grass Valley, California, 154pp.

Nevada County Promotion Committee. 1904? Nevada County, California. 36pp.

Nicosia, Francesco M. 1960. Italian Pioneers of California. Published by Italian American Chamber of Commerce of the Pacific Coast, 32pp.


The Pacific Miner. 1893-1911. Published Monthly in San Francisco, California, 19 volumes.


Placer County. 1912-1913. *Assessment Rolls.*


________. 1867 and 1894. *Great Register.*


Placer County, Board of Trade. 1887? *Placer County, California.* Auburn, 16pp.


Placer County Citrus Colony. 1889. 24pp.


The Plymouth Consolidated Gold Mine. 1886. Notes on Amador, Phoenix, Empire and Other Mines in Amador, County, California, 1885. Typewritten progress statement, November 1, 1886.


Records of the Mississippi Valley, Junction Bluff and North San Juan Mining Districts in Bridgeport Township, Nevada County, California, 1852-1871.


Sargent, J. L., Mrs., ed. 1927. Amador County History. Amador County Federation of Women's Clubs, Published by the Amador Ledger, Jackson, California, 127pp.


Shepard, W. A. 1904. Resources of Placer County, California. Placer County Improvement and Development Association and Placer County Board of Supervisors, 24pp.

Silliman, Benjamin. 1867. "Notes on the Grass Valley District." In: Pamphlets on Mining, a collection of paraphernalia on mining in California and Nevada bound by the Bancroft Library, University of California, Berkeley, California, 14pp.


_________. 1911. "Modern Mining Methods." The Pacific Miner, April 1911, pp. 119-121.


Willey, W. L. 1852-1873. Correspondence, Diaries, and Records of Mining, Wagoneering, and Shopkeeping in El Dorado County.


MAP BIBLIOGRAPHY

American River Divides. 1867. Four Maps. California Geological Survey Collection, No. 266, Bancroft Library, University of California, Berkeley, California, no scale.


. 1871b. Nevada County Road Surveys. Sketch map, scale 1:253,440.

. 1873. Map of Georgetown Divide, El Dorado County... showing the property of the California Water Company. Housed in Bancroft Library Collection, University of California, Berkeley, California, no scale.

Bridges, Francis. 1897. Map Showing the Mother Lode North of Jackson, Amador County, California. No scale.


California. State Mining Bureau. 1900? County of Nevada, California. Issued with a register of mines and minerals for the county. Sacramento, California, no scale.

. 1900? County of Placer, California. Issued with a register of mines and minerals for the county. Sacramento, California, no scale.

. 1903. County of Amador, California. Issued with a register of mines and minerals for the county. Sacramento, California, no scale.

County of El Dorado, California. Issued with a register of mines and minerals for the county. Sacramento, California. No scale.


Hochholzer, H. 1863. Topographical Map of the Ridge Between the Middle and South Yuba. California Geological Survey map collection, Bancroft Library, University of California, Berkeley, California, 1:300,000


Huerne, P. 187? Map showing the location of the principal mining companies on the Blue Gravel Channels. H. S. Bradley, Britton and Rey, Lithographers, San Francisco, California, no scale.

Leuder, William. 193? Mining Towns of California, 1848-1858. Drafted by Work Progress Administration, Scale 1:125,000.


Map of Central California Showing Different Railroad Lines Completed and Projected. 1860. G. W. Welch, Nevada City, California, Scale equals approximately 1:280,000.

Map of Central Pacific Railroad and Its Connections. 1876? n. p., no scale.

Maps and Diagrams of Mines and Mining Claims in Nevada County, California. 1890-19_? Collection of 13 maps of mines and mining properties. Size, scale and publishers vary. In Bancroft Library, University of California, Berkeley, California, no scale.

Maps and Diagrams of Mines and Mining Claims in Placer County, California. 1890-19_? Collection of six maps of mines and mining properties. Size, scale and publishers vary. Bancroft Library, University of California, Berkeley, California.


Map of the Mother Lode. 1938. Published by Pony Express Courrier, Placerville, California, no scale.

Map of a Part of Nevada and California Showing Travel Routes Prior to 1870. 1939. J. D. Galloway, Engineer, Based on U. S. Geological Survey Topographic Maps. Scale equals approximately 1:296,000.


Map of the State of California Showing the Exact Extent of Territory Granted by Congress to the Various Railroads in the State. Lithography by Britton and Rey, San Francisco, California, no scale.
Map Showing the Tributary to San Francisco and Mother Lode Central. 1900. n. p., no scale.

Map Showing the Properties of the Shanty Mierson, Hong Kong, and Jackson Mines, El Dorado County, California. 192? Scale 1:5,000.

Map Showing the Route of the Stockton and Ione Railroad. 1874. T. W. Norris Collection, Bancroft Library, University of California, Berkeley, California, scale 1:253,440.

Mather, J. C. 1868. Birchville (and vicinity, Nevada County, California), California Geological Survey Collection, No. 47, Bancroft Library, University of California, Berkeley, California, scale 1:2,400.


Nevada County Road Tracings. n.d. Seven tracings of roads and ditches in Nevada and part of Placer Counties. Stamped with California Geological Society. Housed in Bancroft Library Map Collection, University of California, Berkeley, California, no scale.

Nevada County West of Eureka and Saw Mill. 1870? California Geological Survey Collection, No. 212, Bancroft Library, University of California, Berkeley, California, scale 1:190,000.


Proctor, W. E. 189? Map of a Portion of Amador County, California, Published by the Amador Record, Sutter Creek, scale 1:63,360.


Route of Central Pacific Railroad: Between Roseville and Truckee, Placer County, California. 186?. California Geological Survey, Collection No. 6, Bancroft Library, University of California, Berkeley, California, no scale.


Six Miles of the Mother Lode in Amador County. 191?. Longitudinal Projection showing vertical depths of shafts, scale 1:16,300.


. 190?. Map of the North Star Mine Showing the Irish American Grass Valley Mining District. Scale 1:480.


. 1903. Map Showing the Harmony Channel and a Portion of Nevada City Mining District. Scale 1:15,840.
Western Amador and Northern Calaveras Counties, California. 187_?


APPENDIX ONE:

METHODS OF POPULATION DATA COMPILATION

The information on population and its changes was compiled by sampling the manuscript population censuses and extrapolating to classify the total population into occupational and birthplace categories. The censuses used for this analysis were those of 1860, 1870, 1880, and 1900 (the 1890 census was destroyed by fire). Six occupational categories were designated. They are: mining, including miner, mine worker, mine or mill owner, millman, mill tender, amalgamator, battery feeder, quarryman, stone cutter, mining engineer or geologist, mineralogist, and mine laborer; agriculture, including farmer, farm laborer, gardener, shepherd, herder, stock raiser, vintner, horticulturalist, fruit grower, and any other crop or livestock production function; labor, including only laborer, day laborer, and common laborer; transport, including teamster, drayman, packer, railroad laborer, railroad engineer, other railroad worker, stage driver, stage owner, and toll road keepers and collectors; lumber, including woodcutter, shake-maker, lumberman, timber cutter, charcoal maker, sawyer, sawmill owner, and sawmill laborer, and Other, including ditch tenders, ditch builders, and all others not designated above. In addition to this occupational data, birthplace
was noted by state or country to enable analysis of ethnic changes and preferences for occupations.

The method of data collection was to record the information for every fifth male over 15 years of age. Employed females were ignored, as were employed males aged 15 years and younger. The latter agrees with the U.S. Census definition of an adult employed male. The figures reported in the text on occupational categories and ethnic groups were the result of multiplying the collected statistics by five. Numbers of total population and employed males are exact, the result of full counts of all manuscripts.

Dependence on each occupation was assessed by counting all unemployed dependents of each sampled worker as well as the worker himself. Multiplication by five, thus, enumerated the dependents and also isolated the number of individuals with no determinable source of support. Each employed male was considered to support himself. In the case of two or more workers in a family unit, the dependents were divided according to several criteria. First, the head of household, if employed, was accorded support credit for two dependents other than himself. Other workers were accorded one dependent other than themselves. But, adjustments were made based on relative salary levels as reported in the censuses. Miners, farmers, lumbermen, and some services were accorded incomes
1.5 times those of laborers, farm laborers, and some other mineral services.

By the above methods, therefore, data were compiled for occupation and birthplace, and extrapolated from the 20 percent sample to provide the figures for population analyses in this study.
APPENDIX TWO:

METHODS OF TOWN MAP DATA COMPILATION

The following methods were used in compilation of the town maps. The data for the first map (7-1) were taken from a Work Progress Administration map by William Leuder. No attempt to corroborate, change, or add to this map was made. The inclusion of towns on the other four town maps (7-2, 7-3, 9-4, and 10-4), however, resulted from the following procedures. The years 1867, 1880, 1895, and 1914 were chosen for the completeness of at least two sources of primary data, plus their adequate temporal spacing. A town appears on a map if it was listed in the voter registration rolls plus at least one map from that year. Post office records and county histories were also checked to further verify town presence in each case.

Approximation of town size was a more complicated procedure. Where listed it was taken from secondary or primary records. Most of the towns on the 1880 map were recorded in the 1880 U.S. Census, but only the largest towns were estimated regularly at other times. Therefore, in each case for the remainder, registered voters were counted. The population statistics were checked for ratio of total population to employed American males, that is the voters (Note: females were included in the formula for the 1914 map). Figures for a census township

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were used for all the towns within it. This ratio was applied to the number of voters to gauge the total town population.

Due to the many sources of error in this method, the only one possible for ascertaining relative size, board categories were chosen into which each town is classified. Tests on towns with published populations resulted in a perfect score in correctly classifying towns to less than 100, 101 to 500, 501 to 1000, and over 1000. These categories are so broad that for many purposes they are quite weak. Nevertheless, in the interest of accuracy they have been used and still provide considerable new data for settlement geographers and historians.
APPENDIX THREE:

TOWN MAP IDENTIFICATION LISTS
### 1850s Map

#### Amador County

1. Michigan Bar  
2. Big Bar (#1)  
3. Yeomet  
4. Plymouth  
5. Fiddletown  
6. Ft. John  
7. Volcano  
8. West Point  
9. Aqueduct City  
10. Clinton  
11. Slabtown  
12. Stony Bar  
13. White's Bar  
14. Big Bar (#2)  
15. Middle Bar  
16. Butte City  
17. Jackson  
18. Sutter Creek  
19. Amador City  
20. Lower Rancheria  
21. Drytown  
22. Irish Hill  
23. Muletown  
24. Ione  
25. Buena Vista  
26. Put's Bar  
27. Lancha Plana  
28. Winter Bar  
29. Georgia Slide  
30. Greenwood  
31. Jones Hill  
32. Spanish Dry Diggings  
33. Oregon Bar  
34. Poverty Bar  
35. Maine Bar  
36. Hoosier Bar  
37. Wildcat Bar  
38. Browne Bar  
39. Murderer's Bar  
40. Hogg's Diggings  
41. Whisky Bar  
42. Horseshoe Bar  
43. Doton Bar  
44. Condemned Bar  
45. Negro Hill  
46. Mormon Island  
47. Willow Springs  
48. Salmon Falls  
49. Centreville  
50. Pilot Hill  
51. Dutch Bar  
52. Georgetown  
53. Jackass Flat  
54. Johntown  
55. Wisconsin Flat  
56. American Flat  
57. Spanish Flat  
58. Louisville  
59. Uniontown  
60. Coloma  
61. Kelsey  
62. Chile Bar  
63. Pinchemtight  
64. Clarkson  
65. Mosquito  
66. White Rock  
67. Smith's Place  
68. Placerville  
69. Diamond Springs  
70. El Dorado  
71. Shingle Springs  
72. Deer Creek

#### El Dorado County
<table>
<thead>
<tr>
<th>Nevada County</th>
<th>Placer County</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Spenceville</td>
<td>1. Dutch Flat</td>
</tr>
<tr>
<td>2. Empire Ranch</td>
<td>2. Illinoiostown</td>
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<tr>
<td>3. Mooney Flat</td>
<td>3. Gold Run</td>
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<tr>
<td>4. Industry Bar</td>
<td>4. Euchre Bar</td>
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<tr>
<td>5. Boston Bar</td>
<td>5. Humbug Bar</td>
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<tr>
<td>6. Ohio Bar</td>
<td>6. Damascus</td>
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<tr>
<td>7. Bridgeport</td>
<td>7. Fork's House</td>
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<tr>
<td>8. French Corral</td>
<td>8. Maintop</td>
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<tr>
<td>10. Birchville</td>
<td>10. Rector's Bar</td>
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<tr>
<td>11. Sweetland</td>
<td>11. Eureka Bar</td>
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<tr>
<td>13. San Juan</td>
<td>13. Kelley Bar</td>
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<tr>
<td>15. Cherokee</td>
<td>15. Mineral Bar</td>
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<tr>
<td>17. Columbia Hill</td>
<td>17. Wisconsin Hill</td>
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<tr>
<td>18. Lake City</td>
<td>18. Barnes Bar</td>
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<td>20. Galbreath</td>
<td>20. Forest Hill</td>
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<td>22. Snow Tent</td>
<td>22. Todd's Valley</td>
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<td>23. Moore's Flat</td>
<td>23. Spring Garden</td>
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<td>24. Orleans Flat</td>
<td>24. Ford's Bar</td>
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<td>25. Snow Point</td>
<td>25. American Bar</td>
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<td>27. Lang's</td>
<td>27. Masonic Bar</td>
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<td>28. Omega</td>
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<td>29. Washington</td>
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<td>30. Alpha</td>
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<tr>
<td>31. Scott's Flat</td>
<td></td>
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<tr>
<td>32. Little York</td>
<td></td>
</tr>
<tr>
<td>33. You Bet</td>
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</tr>
</tbody>
</table>
28. Sandy Bar
29. Yankee Slide Bar
30. Rocky Bar
31. Volcano Bar
32. Dutch Bar
33. Yankee Bar
34. Green Mountain Bar
35. Kennabec Bar
36. Brizzly Flat
37. New York Bar
38. Louisiana Bar
39. Auburn
40. Ophir
41. Newcastle
42. Wild Goose Bar
MAP 7-2: TOWNS OF THE CENTRAL MINES, 1867

[Map showing towns and their population size categories: > 1000, 501-1000, 101-500, 100 or less.]

AMADOR CO.

PLACER CO.

ELDORADO CO.

NEVADA CO.
1867 Map

Amador County
1. Arkansas Diggings
2. Mineral City
3. Forest Home
4. Willow Springs
5. Irish Hill
6. Q Ranch
7. Mule Town
8. Ione City
9. Buena Vista
10. Opera Camp
11. Lancha Plana
12. Double Springs
13. Butte City
14. Jackson
15. Oneida
16. Sutter Creek
17. Amador
18. Old Rancheria
19. Placerville
20. Smith Flat
21. Webberville
22. Diamond Springs
23. Missouri Flat
24. El Dorado (Mud Springs)
25. Shingle Springs
26. Clarksville
27. Cothrinsville
28. Latrobe
29. Nashville
30. Fair Play
31. Indian Diggings
32. Grizzly Flat

Nevada County
1. Spenceville
2. Mooney Flat
3. Bridgeport
4. French Corral
5. Birchville
6. Sweetland
7. North San Juan
8. Columbia Hill
9. Lake City
10. North Bloomfield
11. Cherokee
12. Moore's Flat
13. Woolsey
14. Eureka
15. Relief Hill
16. Washington
17. Omega
18. Shelby Flat
19. Nevada City
20. Rough and Ready
21. Grass Valley
22. Limekiln
23. Pleasant Valley
24. Red Dog
25. Hunt's Hill
26. You Bet
27. Little York
28. Remington Hill
29. Lowell Hill
30. Liberty Hill
Placer County

1. Alta
2. Dutch Flat
3. Thompson Hill
4. Gold Run
5. Secret Town
6. Colfax
7. Illinois Town
8. Iowa Hill
9. Wisconsin Hill
10. Michigan Bluffs
11. Sarahsville
12. Bath
13. Forest Hill
14. Yankee Jims
15. Todd's Valley
16. Poverty Bar
17. Nielsburg
18. Auburn
19. Virginia
20. Gold Hill
21. Ophir
22. Newcastle
23. Manhattan Bar
24. Rattlesnake Bar
25. Pino
26. Rocklin
MAP 7-3: TOWNS OF THE CENTRAL MINES, 1880
1880 Map

Amador County

1. Willow Springs
2. Ione
3. Lancha Plana
4. Jackson
5. Sutter Creek
6. Amador
7. Drytown
8. Plymouth
9. Fiddletown
10. Pine Grove
11. Volcano
12. Aqueduct City
13. Forest Home
6. Rough and Ready
7. Grass Valley
8. Nevada City
9. Blue Tent
10. North Columbia
11. Lake City
12. North Bloomfield
13. Cherokee
14. Moore's Flat
15. Relief Hill
16. Eureka
17. Graniteville
18. Washington
19. Omega
20. Lowell Hill
21. You Bet
22. Little York

El Dorado County

1. Pilot Hill
2. Greenwood
3. Georgia Slide
4. Georgetown
5. Uniontown
6. Coloma
7. Gold Hill
8. Kelsey
9. Placerville
10. Smith Flat
11. Diamond Springs
12. El Dorado
13. Shingle Springs
14. Clarksville
15. Latrobe
16. Nashville
17. Fairplay
18. Grizzly Flat
19. Indian Diggings
20. Salmon Falls
1. Blue Canon
2. Towle's Mills
3. Alta
4. Dutch Flat
5. Gold Run
6. Colfax
7. Damascus
8. Sunnysouth
9. Monona Flat
10. Iowa Hill
11. Wisconsin Hill
12. Grizzly Flat
13. Michigan Bluff
14. Bath
15. Forest Hill
16. Yankee Jims
17. Todd's Valley
18. Bird Flat
19. Butcher Ranch
20. Clipper Gap
21. Auburn
22. Virginia
23. Ophir
24. Newcastle
25. Penryn
26. Pino
27. Rocklin

Nevada County

1. French Corral
2. Birchville
3. Sweetland
4. Sebastopol
5. North San Juan
### 1895 Map

#### Amador County
1. Forest Hill
2. Carbondale
3. Ione
4. Ranlett
5. Ritchey
6. Lancha Plana
7. Jackson
8. Sutter Creek
9. Amador City
10. Drytown
11. Plymouth
12. Oleta
13. Electra
14. Pine Grove
15. Volcano
16. Defender

#### Nevada County
1. Spencerville
2. Fernley
3. Anthony House
4. French Corral
5. Sweetland
6. North San Juan
7. North Columbia
8. North Bloomfield
9. Relief
10. Moore's Flat
11. Graniteville
12. Gaston
13. Washington
14. Maybert
15. Lowell Hill
16. You Bet
17. Nevada City
18. Grass Valley
19. Rough and Ready
20. Chicago Park
21. Wolf

#### El Dorado County
1. Salmon Falls
2. Cool
3. Greenwood
4. Georgetown
5. Garden Valley
6. Pilot Hill
7. Lotus
8. Coloma
9. Rescue
10. Green Valley
11. Clarksville
12. Latrobe
13. Shingle Springs
14. Nashville
15. El Dorado
16. Diamond Springs
17. Placerville
18. Smith Flat
19. Newtown
20. Pleasant Valley
21. Fairplay
22. Indian Diggings
23. Grizzly Flat
24. Pyffe
25. Pacific
26. Pinogrande

#### Placer County
1. Blue Canyon
2. Shadyrun
3. Towle
4. Alta
5. Dutch Flat
6. Gold Run
7. Damascus
8. Michigan Bluff
9. Forest Hill
10. Yankee Jims
11. Iowa Hill
12. Colfax
13. Weimar
14. Applegate
15. Butcher Ranch
16. Clipper Gap
17. Bowman
18. Auburn
19. Ophir
20. Newcastle
21. Penryn
22. Loomis (Pino)
23. Rocklin
MAP 10-4: TOWNS OF THE CENTRAL MINES, 1914
1914 Map

Amador County

1. Waterman
2. Ione
3. Richey
4. Lancha Plana
5. Jackson
6. Sutter Creek
7. Amador City
8. Drytown
9. Plymouth
10. Oleta
11. Electra
12. Pine Grove
13. Volcano
14. Defender
15. Spenceville
16. Fernley
17. Bridgeport
18. French Corral
19. North San Juan
20. Tyler
21. North Columbia
22. North Bloomfield
23. Relief
24. Moore's Flat
25. Graniteville
26. Gaston
27. Washington
28. Lowell Hill
29. Chicago Park
30. Peardale
31. Nevada City
32. Town Talk
33. Grass Valley
34. Rough and Ready
35. Wolf

El Dorado County

1. Cool
2. Pilot Hill
3. Greenwood
4. Josephine
5. Virner
6. Georgetown
7. Garden Valley
8. Lotus
9. Coloma
10. Slatington
11. Pino Grande
12. Fyffe
13. Pacific
14. Park
15. Caldor
16. Leonis
17. Grizzly Flat
18. Indian Diggings
19. Omo Ranch
20. Coles
21. Pleasant Valley
22. Newtown
23. Fairplay
24. Uno
25. Aukum
26. Smith Flat
27. Placerville
28. Diamond Springs
29. El Dorado
30. Shingle Springs
31. Rescue
32. Clarksville
33. Latrobe
34. Camino

Nevada County

1. Cool
2. Pilot Hill
3. Greenwood
4. Josephine
5. Virner
6. Georgetown
7. Garden Valley
8. Lotus
9. Coloma
10. Slatington
11. Pino Grande
12. Fyffe
13. Pacific
14. Park
15. Caldor
16. Leonis
17. Grizzly Flat
18. Indian Diggings
19. Omo Ranch
20. Coles
21. Pleasant Valley
22. Newtown
23. Fairplay
24. Uno
25. Aukum
26. Smith Flat
27. Placerville
28. Diamond Springs
29. El Dorado
30. Shingle Springs
31. Rescue
32. Clarksville
33. Latrobe
34. Camino

Placer County

1. Blue Canon
2. Towle
3. Alta
4. Dutch Flat
5. Gold Run
6. Damascus
7. Michigan Bluff
8. Forest Hill
9. Yankee Jims
10. Iowa Hill
11. Colfax
12. Lander
13. Weimar
14. Applegate
15. Clipper Gap
16. Butcher Ranch
17. Bowman
18. Auburn
19. Ophir
20. Newcastle
21. Penryn
22. Loomis
23. Rocklin
APPENDIX FOUR:
GLOSSARY OF MINING TERMS

Amalgamation: Extraction of gold or other precious metals from parent material by use of mercury.

Arrastra: A circular mill that drags heavy stones around a track, crushing the ore placed in front of them.

Chili mill: Similar to an arrastra, but uses a large stone wheel in place of loose boulders.

Crosscut: An adit or tunnel dug at right angles to the passage being worked. Usually dug in order to search for feeder veins of gold.

Debris: Waste rock from mines, especially hydraulic mines.

Drift mining: Mining of gold in Tertiary gravel ridges by tunneling into the ridge and following a former streambed to extract the ancient placer gold.

Flume: An artificial channel, usually made of wood, for conducting water.

Grade: The relative value of an ore or mineral product. Ores were usually referred to as high-grade or low-grade.
Ground sluicing: Mining a gravel ridge by conducting water to the ridge-top in flumes and then down the slope in a channel dug for that purpose. Gold-bearing gravel is then shovelled into the channel and gold collected in a subsequent sluice system. In some cases, ground sluicing also aims at caving in the banks of the channel for speedy treatment of material.

Hydraulic mining: Mining by directing a stream of water through a hose and nozzle against a ridge of gold bearing earth or gravel. The material then flows into sluices where the gold was separated.

Little Giant: Hydraulic mining monitor. Resembles a cannon and was used to direct water with high pressure.

Lode: A mineral containing ledge or vein.

Long Tom: Precursor of the sluice box. A wooden trough with riffles along the bottom and a grated hopper at the upper end. Water and material is introduced to the top end and moves through the tom by gravity, with the heavy gold being caught along the riffles.
Miner's Cradle or Rocker: A sloped wooden box on rockers with a sieve at the upper end and riffles. Material and water are introduced and the movement through the cradle aided by a rocking the box back and forth.

Miner's Inch: Unit of water measurement. The quantity of water that will pass through a one square inch aperture under a head of six inches, equal to 1/40 of one cubic foot per second.

Mining Claim: A portion of the public domain which a miner takes and holds in accordance with local and federal mining statutes in order to mine. The land reverts to public domain when it is abandoned or production is insufficient (Generally $100 per year production is required).

Mining Ditch: A ditch dug for conduction of water to a site for mining purposes.

Placer Gold: Gold eroded from parent rock and deposited along a stream bed or bank by the action of running water.
Quartz Mining: Loosely applied to all mining of gold in hard-rock encased veins.

Shaft: A vertical excavation, generally from the surface, made for finding, mining, and raising ore, plus other associated material, and for lowering men and tools into the mine.

Sluice Box: An elongated series of wooden troughs connected one to another through which water and gold-bearing material flow. The gold collects along riffles or obstructions on the bottom of each box.

Square-Set Timbering: A method of reinforcing tunnels by constructing wood-frame cubes. Often filling in the openings along the sides with debris or other material further strengthens the construction.

Stamp Mill: A machine that pounds rock into powder by raising and dropping heavy, iron blocks. The stamps, as the iron blocks are known, are raised by a cog wheel driven by water power in most cases.
Stope: An excavation of ore in a quartz mine. It could be horizontal or vertical but does not include the sinking of a shaft.

Tailings: Wasted ore that is regarded as too poor to be treated further. See debris.

Tertiary Gravel: Eroded material deposited by rivers in the Tertiary geologic period.

Vein: A fissure in the rock formation into which gold or other minerals precipitated in the process of cooling and expansion.
VITA

Lary Michael Dilsaver was born in Oakland, California on August 9, 1949. After graduating from Bishop O'Dowd High School in Oakland, he attended California State University, Hayward taking a Bachelors degree in Geography in 1971 and a Masters in geography in 1977. Thesis work under William L. Thomas concentrated on the role of geographic training in successful careers in the tourist industry. Doctoral work at Louisiana State University under Sam B. Hilliard focused on historical geography of frontier America, specifically the far western mining frontiers.

Employment has included map librarian, research assistant evaluating settlement change in Vietnam, research assistant for a tourism development association, travel agent, and instructor of geography at Louisiana State University.
EXAMINATION AND THESIS REPORT

Candidate: Lary Michael Dilsaver
Major Field: Geography
Title of Thesis: FROM BOOM TO BUST: POST GOLD RUSH PATTERNS OF ADJUSTMENT IN A CALIFORNIA MINING REGION

Approved:

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Major Professor and Chairman
Dean of the Graduate School

EXAMINING COMMITTEE:

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Date of Examination: March 18, 1982