

## CALIFORNIA GOLD MINING LANDSCAPES

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California is known as the "Golden State." Gold was the principal attraction for the early pioneers and its exploitation stimulated the growth of the state for many years. This precious yellow metal led California's mineral production for over half a century, until surpassed by petroleum in 1907, but gold continued to be the state's most valuable metallic mineral until World War II. Since 1848, California has yielded more than 100,000,000 troy ounces of gold, valued at nearly \$2,500,000,000.<sup>1</sup>

Today, California gold mining is almost non-existent. The last major gold mining operation in the state—a dredge working on the Yuba River—ceased operations in October, 1968 (Fig. 1). With the shutdown of this dredge, gold mining as an industry virtually ended in California.<sup>2</sup> A few mines are still in partial operation and some gold is found by amateur prospectors and skin divers. However, most gold produced today is a by-product of other mining operations. In 1968, only about 15,000 ounces of gold, valued at slightly more than \$600,000, was produced.<sup>3</sup> Nearly two-thirds of this figure came from Yuba River operations. Record yield occurred in 1852—the height of the Gold Rush—when an estimated 4,000,000 ounces were recovered.

### GOLD MINING LANDSCAPES

The past exploitation of this precious yellow metal has left a striking imprint on the land. Some conceptions of a gold mining landscape may include roads, settlements, and other features associated with the exploitation of the metal. This paper, however, focuses on the several types of landscapes created by the mining operations themselves.

Four distinct types of landscapes are associated with gold mining. Most are located in the foothills of the Sierra Nevada, with secondary locations in the Klamath Mountains. A few gold mining landscapes are scattered throughout the Trans-Sierra and the Mojave Desert (Fig. 2).



Figure 1.

A floating gold dredge. This dredge is of the same design as the last operating dredge in California.

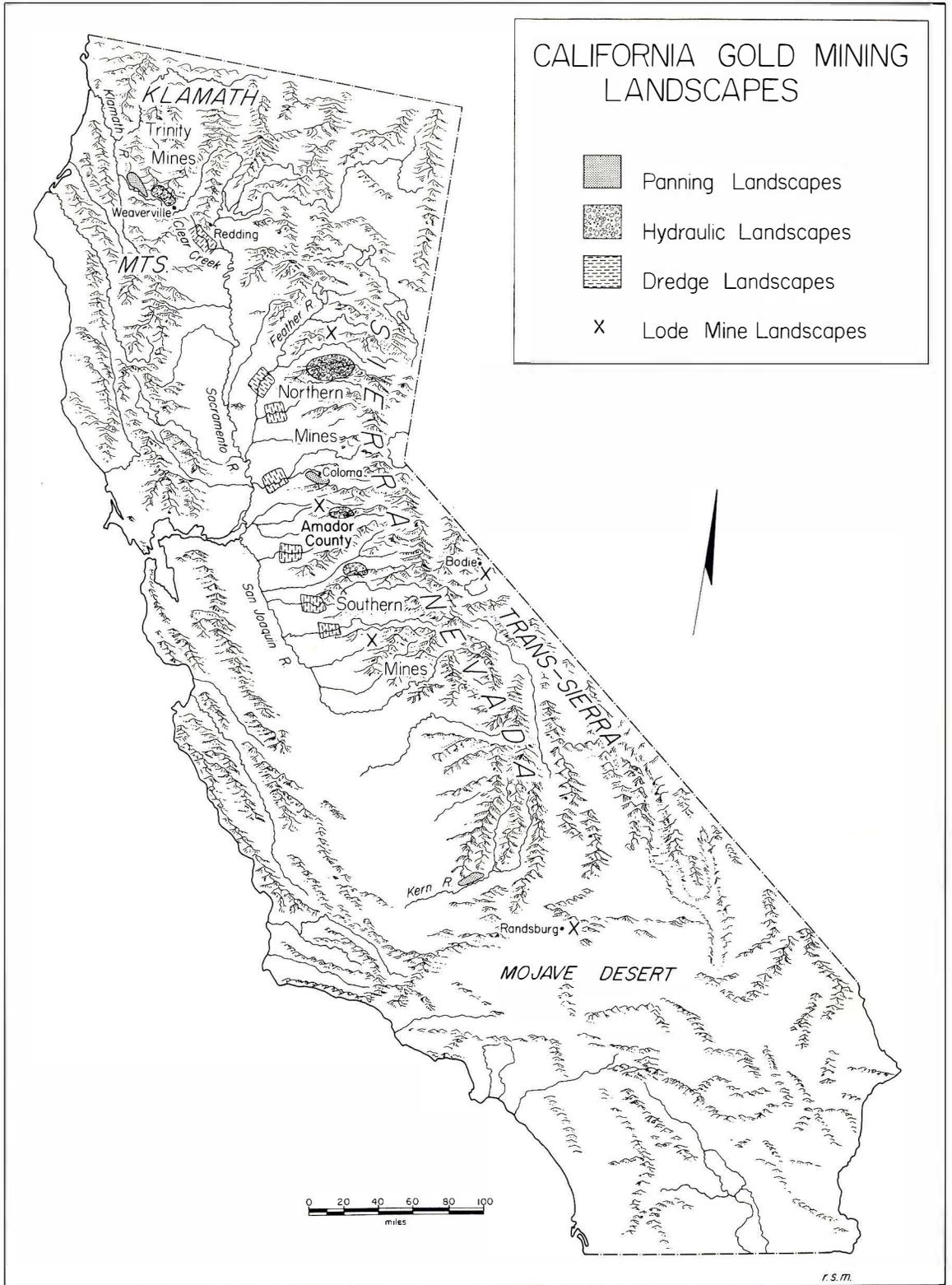


Figure 2

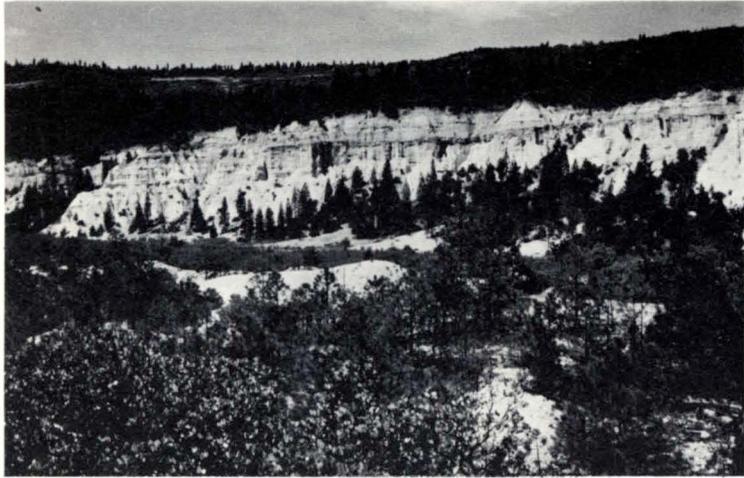


Figure 3.

The Malakoff Diggings. This area has recently been made into a state park to preserve this gold mining landscape.



Figure 4.

Dredge landscape along the Yuba River. This landscape occupies some twenty square miles.



Figure 5.

The Pine Tree and Josephine mine. This mine, north of Mariposa, is one of the few in the Mother Lode to still have surface buildings.



Figure 6.

The Kennedy mine. Two of the three remaining tailing wheels are in the foreground; in the background, the headframe rises over the remains of the bunkers. All other surface equipment has been removed.

## PANNING LANDSCAPES

The least perceivable gold landscapes are areas of panning debris. A small scale of operation and scattered locations have made this landscape type much more difficult to recognize than other gold landscapes which represent larger operations and more centralized locations. Panning landscapes are often marked by round, symmetrical piles of rock and gravel from one to three feet in height, generally evenly spaced over an area. These piles are often obscured by grass, brush, and trees, and their distinctive shape has sometimes been greatly modified by over a century of erosion. Along the smaller intermittent streams, sharp angular rocks—which contrast markedly with stream-rounded ones—also distinguish a panning landscape.

Placer gravels containing gold weathered from quartz veins and transported by water were first exploited on a large scale during the Gold Rush of 1848-1849. The first implements used were the pick and the pan. Soon, machines were developed which enabled the miners to process larger amounts of dirt and gravel. The rocker, the long tom, and the sluice were basically wooden boxes or troughs into which auriferous gravel and water were poured. The lighter materials were washed out of the box and the gold, being heavier, dropped to the bottom, where it was caught by cleats.<sup>4</sup>

The primary locations of this early placer mining—and hence today's panning landscapes—are the stream valleys along the western slope of the Sierra Nevada. Following the historic discovery by James Marshall at Coloma on January 24, 1848, the American River became the initial goal of most gold seekers. Quickly the Argonauts began to search northward to the Feather River and southward to the Kern. North of Amador County the diggings were called the "Northern Mines" and south of this county they were termed the "Southern Mines." Gold was also discovered on the Klamath River in 1848, and many miners moved into the Trinity Mines.

Although most of the Sierra foothills and much of the Klamath Mountains have been well-worked for gold, panning landscapes are today limited in extent and occupy very small areas. In addition to the reasons cited above, reservoirs on the major rivers have inundated many placer mining areas. Since this was usually the initial type of mining in most areas, subsequent settlements have expanded over and eradicated many placer remnants.

Rich surface placers were quickly exhausted. By the middle 1850's, miners were turning to other methods to reach deeply buried auriferous gravels. In the Sierra, gold had been trapped in stream channels of tertiary age and these channels had been buried by volcanic deposits.

## HYDRAULIC LANDSCAPES

The chief method of exploiting these buried gravels—hydraulicking—has created the second type of gold mining landscape. This type of mining began near Nevada City in 1852 and spread rapidly throughout the Sierra foothills and the Klamath Mountains.<sup>5</sup> It involved the direction of a jet of water against a hillside. The stream of water undermined the hillside and the earth and gravels were then washing through a sluice to trap the gold. Because of the depth of these buried channels, hydraulicking became the cheapest method of exploiting the auriferous gravels.

Hydraulicking ended for all practical purposes in 1884. A judicial decision prohibited the dumping of debris in the Sacramento and San Joaquin Rivers and their tributaries.<sup>6</sup> The mines had been dumping their waste into streams which carried it into the Central Valley, covering once prime farm land with silt and debris. The decree did not outlaw hydraulic mining itself, but the costs involved in impounding the debris made most hydraulic operations unprofitable, and hydraulicking has been of little importance since this date. A few hydraulic operations—principally in the Klamath Mountains—have been worked since 1884, but their output has been minimal compared with other types of gold mining.

Hydraulic landscapes are widely scattered in the foothills of the Sierra Nevada. Near Columbia, hydraulic mining has washed away soil and left the limestone bedrock visible. In some places, pillars of dark grey limestone rise some ten feet from the surrounding ground

level; these may be as large as five or six feet in width. Broken smaller pieces litter the ground adjacent to the huge boulders. Much of this area is overgrown with the "Tree of Heaven," a plant brought to California by Chinese miners.

The area around Volcano also presents a hydraulic landscape. Mining activities were not as intense as at Columbia, so more soil remains. The exposed bedrock here is limestone and the appearance of the Volcano area is similar to that of Columbia. Fewer pillars of limestone mark this landscape and much of the hydraulic debris is overgrown by berry vines.

Perhaps the most striking example of a hydraulic gold mining landscape is the Malakoff Diggings (Fig. 3). A badlands has been created by the washing away of the hillsides. These badlands are faced with steep cliffs and badly gouged ravines, and soil layers of tan and buff colors have been exposed. Erosion has modified these scars in the earth and they are now clothed with a cover of pines.

Another area of hydraulic landscape is near Weaverville in the Trinity Mines. This area resembles the badlands of the Malakoff Diggings. A great scar has been created on the surface and the hydraulic activities are clearly evident. Mining continued into the 20th century and large-scale operations ceased about 1918.

Many smaller areas in the Sierra Nevada and the Klamath Mountains exhibit areas of hydraulic landscape. Badlands areas and regions of exposed bedrock reveal the extent of past hydraulic mining. Hydraulic landscapes are much more evident than panning landscapes; in fact, many panning areas have been eradicated by later hydraulic operations.

#### DREDGE LANDSCAPES

The third type of gold mining landscape—dredge tailings—is also associated with placer gravels. Dredging in California began on the Feather River near Oroville in 1898.<sup>7</sup> This landscape is most notable in the Central Valley along the major rivers flowing from the Sierra Nevada. Characteristically, dredge areas are recognized by the orderly rows of rock piles. Often these tailings are composed of rocks with little or no dirt or alluvial material present. Where dirt is present, the rock piles are obscured by vegetation.

The extent of a dredge landscape is related to the type of dredger which operated. On small streams, drag-line dredges have left areas as small as one-tenth of a mile in length by twenty-five feet in width. In spite of their small dimensions, these dredged areas are easily recognizable by their parallel rows of rocks.

Larger floating dredges operating on the Central Valley floor created landscapes that extend over as much as twenty-five square miles. Significant areas of dredge landscapes are located along the Feather River, the Yuba (Fig. 4), on the American, and along the Tuolumne. Smaller dredge areas are located on the Calaveras River and along the Merced River. Streams flowing into the Central Valley from the Klamath Mountains also exhibit dredge landscapes. Clear Creek, south of Redding, has a sizeable area of dredge tailings.

Dredge landscapes are perhaps the most striking and most discernible of the gold mining landscapes of California. The parallel rows of tailings clearly indicate the intensity of past gold mining activity, and any vestiges of the previous landscape have been completely eradicated and covered with the dredge landscape.

#### LODE MINE LANDSCAPES

The last type of landscape is associated with lode deposits rather than placer gravels. Lode gold was in its place of origin and became the basis of hardrock mining. Lode mine landscapes are scattered and cover very small areas in comparison with the landscapes associated with the exploitation of placer gravels. The largest lode mine landscape covers less than five acres. Because most of the mining was carried on deep within the earth, there is often little surface evidence of these landscapes.

A prominent feature of almost all lode mines is the tailings pile. This waste often forms a distinctive landform at or near the mine site. Many of the mine buildings and most of the surface equipment have been removed, but a few headworks buildings still stand (Fig. 5). Commonly, they are of corrugated iron sheets attached to a wooden framework. Several

steel headframes rise over tailings piles and the concrete foundations of stamp mills and other machinery used to crush the quartz. A small number of lode mine landscapes are marked by rusting machinery and other surface equipment.

Although lode mining started in 1849, its technology was not perfected until the late 1880's and 1890's. Use of dynamite, use of chlorine and cyanide to treat ores, availability of electricity to replace other sources of power, and improved mining methods in general highlight the long list of achievements of these decades.<sup>8</sup> With the depletion of the surface placers in the early 1860's, the end of hydraulic mining in the early 1880's, and the many technological improvements of the 1880's and 1890's, lode mining became the dominant form of California gold mining in the 20th century.

The history of lode mining reflects rises and declines caused by several factors. Lode mining declined from about 1915 to 1929 because of high costs following World War I. Increased output from dredge operations partially offset these declines. With the depression of the early 1930's, production costs were reduced and the mines increased production. In 1934 the price of gold was increased from about \$21 to \$35 per ounce. In 1940 gold production amounted to 1,455,000 ounces, valued at nearly \$51,000,000. This was the highest yield since the Gold Rush.<sup>9</sup>

World War II caused a precipitous drop in gold production. All gold mines were shut down in 1942 by federal government order. After nearly four years of idleness, the order was lifted in 1945. Most lode mines, however, remained closed because of rising production costs. A few of the larger mines reopened, but the last large mine on the Mother Lode ceased operations in 1954.<sup>10</sup> The mines at Grass Valley shut down in 1956<sup>11</sup> and the mines at Alleghany closed in 1966.<sup>12</sup>

Lode mine landscapes are most prominent in the Sierra Nevada along the so-called "Mother Lode," a series of gold-bearing veins running from Georgetown southward to Mariposa, a distance of some 120 miles. North of this belt other important lode mining districts are centered on Grass Valley and Alleghany. Several prominent lode mine landscapes are located along the Mother Lode. An immense tailings site, which is estimated to contain over 3,000,000 tons of waste rock, marks the lode mine landscape of Carson Hill. Another impressive feature of this landscape is the glory hole on the north side of the hill. Carson Hill mines have produced over \$26,000,000, including the largest mass of gold ever recovered in California: this lump weighed 195 pounds troy.<sup>13</sup>

A unique form of lode mine landscape is located at the Kennedy mine at Jackson. Four tailings wheels were built to remove tailings from the drainage of Jackson Creek (Fig. 6). The tailings were lifted over a small hill and stored behind an impounding dam. Three of these wheels are presently standing; one has recently fallen in ruins. The Kennedy was the greatest producer of the Mother Lode with a total production of over \$34,000,000. The mine has been idle since 1942.<sup>14</sup>

The area around Bodie in the Trans-Sierra also presents lode mine landscapes. Little surface equipment is left, but the area has many tailings piles and mine adits. A significant area of lode mine landscapes is located at Randsburg in the Mojave Desert. Here, tailings piles are found scattered among the few remaining structures, and the surrounding hillsides are dotted with mine shafts and surface buildings.

Although lode mine landscapes are generally not as impressive as hydraulic or dredge landscapes, lode production has been very important. The Mother Lode between Jackson and Plymouth, a distance of some twelve miles, has produced over \$160,000,000 in gold, and Grass Valley mines have yielded about \$190,000,000 of the precious yellow metal.<sup>15</sup>

#### SIGNIFICANCE OF GOLD MINING LANDSCAPES

These four types of landscapes illustrate the colossal effects on the surface of California caused by gold mining. Gold areas have an "overturned" look. The surface layers have been dug up, turned over, and rearranged by man in his search for gold.

Until recently, gold mining landscapes have been thought to have little or no value. A few small dredged areas have been leveled<sup>16</sup> and some lode mine tailings were reworked in

the depression for gold or used for gravel.<sup>17</sup> However, gravel and boulders precluded agriculture, and the chemicals used for the processing of lode mine ores made general utilization of gold landscapes impractical. In the last few years, however, a practical use has been found for dredge tailings. The Oroville Dam on the Feather River and the new Don Pedro Dam on the Tuolumne are constructed of dredge tailings. Use of these tailings, besides providing materials for the construction of the dams, has resulted in the leveling of areas once covered with debris. Future use of these once valueless areas may include agriculture or recreation.

These man-made gold landscapes stand as a constant reminder of the past importance of gold in the economy of California. Even though erosion has acted on these landscapes for many years, the effects of gold mining will be visible for countless years to come. Such a vast venture as gold exploitation has indeed left its mark.

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