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CHAPTER 1

The Gold Rush Brings Early Water Development



The Sierra Nevada foothills have prospered under the sun's warmth in summer and the grace of mild snow in the winter. Pine and fir trees reach down from the higher mountains to mix with woodland blue oaks, gray pines and the chaparral in the lower elevations. During spring, the meadows burst with color from native flowers. And black bear, bobcat, mule deer and skunk romp in their native habitat in the temperate climate.

More than a thousand years ago, Native Americans lived harmoniously beside the flowing rivers and abundant streams and creeks in the region. These waters, fed by snowmelt higher up in the Sierra, provided the local Hill Nisenan – the name derived from the meaning “from among us” – with ample supplies throughout the year. The climate was mild; the land was green and fresh, and waters bountiful. These people lived simply, and nature provided.

The Nisenan people lived alongside the natural waterways of the foothills long before the Gold Rush.



The office of Coyote and Deer Creek Water Company in the early 1850s was located in Nevada County. This was one of the earliest of the 520 corporations that later became part of PG&E.

The earliest known California water systems can be traced to indigenous tribes as far back as A.D. 800. The Hill Nisenan people were drawn to the Yuba River, Bear River and tributary streams for their life supply; and they carved ditches and waterways to nourish their settlements. These native people built their small communities along waterways, depending on acorns, seeds and wild game for their food source. Before the California Gold Rush, an estimated 7,000 Nisenan lived in natural harmony with the watershed.

The 1848 discovery of gold by James Marshall at Sutter's Mill, located on a bank of the South Fork American River in Coloma, changed everything. When the second major gold strike occurred in the Auburn Ravine five months later on May 16, 1848, the rush was on. California didn't become a state until September 9, 1850, yet once gold was scooped from the riverbeds, instantly people rushed in from all over the world headed for the California foothills to strike it rich. By 1849, an estimated 100,000 newcomers had arrived, permanently transforming the territory. For the Nisenan, it meant decimation of a culture, and the population declined rapidly. For the gold miners, known as "forty-niners," the foothills of the Sierra Nevada promised a prosperous future.

Settling the foothills with the lure of gold

The Auburn Ravine discovery, and subsequent settlement by miners, eventually became the city of Auburn. To the north, Nevada City (known as Caldwell's Upper Store, Coyoteville and Deer Creek Dry Diggings before simply Nevada in the 1850s) was originally a mining camp founded along Deer Creek, where the first gold was found in the area. The settlement rapidly became a proper town, at one point boasting of being the third largest city in California with a population of 10,000. A few miles away, near today's Grass Valley, gold was first found in Wolf Creek in 1848 shortly after Marshall's discovery. The settlement was initially known as Boston Ravine and then Centerville, before the town of "Grass Valley" was incorporated on March 13, 1893.

Prior to 1850, there were no engineered water systems in the Sierra foothills. In the beginning of the Gold Rush, prospectors collected gold using simple panning techniques in the natural flows of the creeks, streams and rivers. The easy pickings were soon gone, however, and miners graduated to placer mining, using extended wooden boxes called "cradles," "rockers" and "long-toms" to filter out the gold from larger

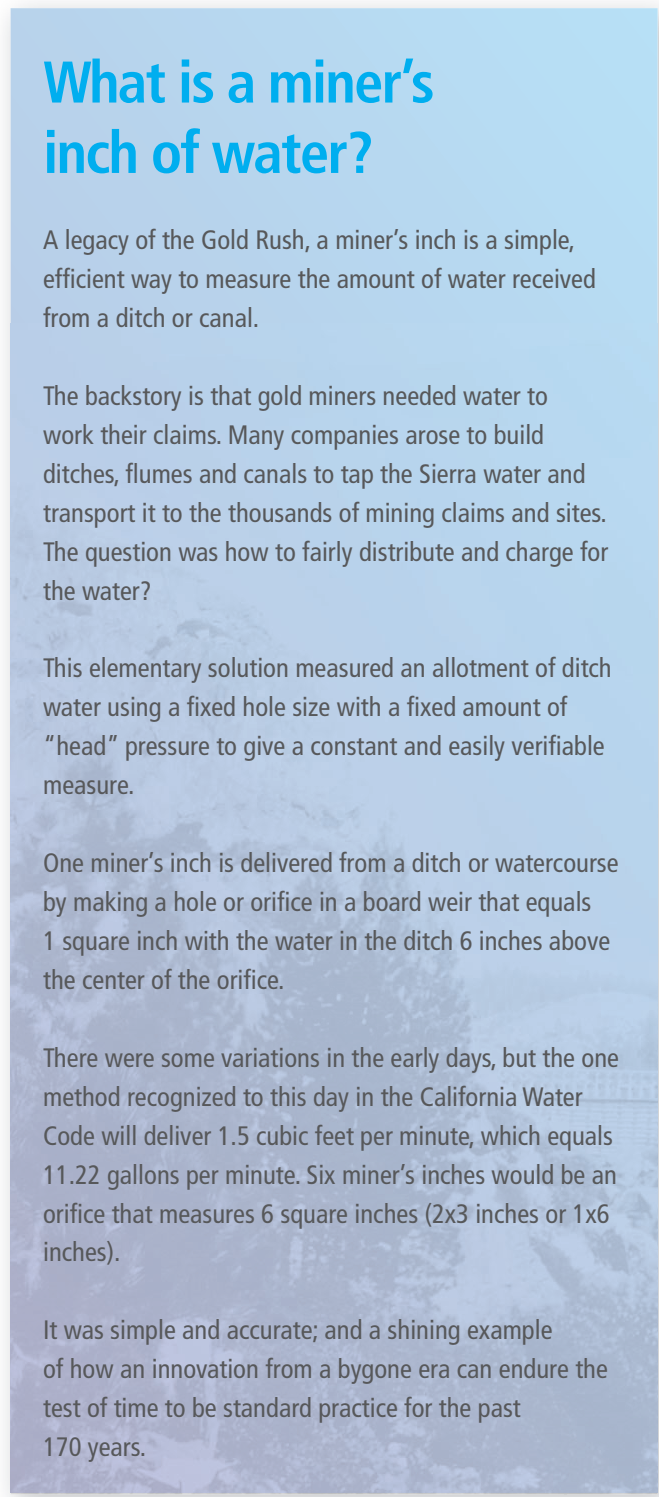
volumes of gravel using water diverted from the waterways. Water was valuable because it was the means to separate gold from the earth.

The enterprising “forty-niners” built hundreds of miles of ditches, flumes and canals to divert water to help ferret out the gold. Most of this development occurred in Nevada County, considered a cradle of California water development.

The importance of these man-made conduits cannot be overstated: “One of the most important agents in developing the resources of (Nevada County) has been the water introduced from natural streams by means of ditches,” wrote W.B. Lardner in his 1924 *A History of Placer and Nevada Counties California*. “During a large part of the year the business of the region must utterly fail were it not for these artificial streams that compensate in a great measure for the drought of the summer season, and enable the miner to pursue his calling. The ditching operations have been generally so profitable to the projectors, and so indispensable to the mining interest, that they now net nearly the whole county. Where good diggings are opened, some enterprising men cast about for a supply of water, and spare no labor to conquer the many obstacles which are presented by a rough, thinly settled country.”

For example, in 1850 a determined man only known in history archives as “Moore” began construction of the Rough and Ready Ditch, from Deer Creek above Nevada City to the boom town of Rough and Ready, with a peak population of 3,000 in the 1850s. Deemed a “lunatic” by the locals for attempting such a feat, Moore wasn’t daunted, got to work and dug for a mile. In the spring of 1851, A.L. Williams and B.O. Williams took up the quest and finished the 13-mile long conduit, which became the state’s first large-scale mining ditch. Interestingly, the Nevada Irrigation District still uses part of the ditch today.

Also in 1850, four Nevada City miners – Charles Marsh, Thomas and John Dunn and William Crawford – dug the Rock Creek Ditch that conveyed water nine miles from Rock Creek, above Nevada City, to the mining camp known as Coyote Hills, or Coyote Diggings, near Sugar Loaf. The ditch took four months to build at a cost of \$10,000, and was bringing water to



What is a miner's inch of water?

A legacy of the Gold Rush, a miner's inch is a simple, efficient way to measure the amount of water received from a ditch or canal.

The backstory is that gold miners needed water to work their claims. Many companies arose to build ditches, flumes and canals to tap the Sierra water and transport it to the thousands of mining claims and sites. The question was how to fairly distribute and charge for the water?

This elementary solution measured an allotment of ditch water using a fixed hole size with a fixed amount of “head” pressure to give a constant and easily verifiable measure.

One miner's inch is delivered from a ditch or watercourse by making a hole or orifice in a board weir that equals 1 square inch with the water in the ditch 6 inches above the center of the orifice.

There were some variations in the early days, but the one method recognized to this day in the California Water Code will deliver 1.5 cubic feet per minute, which equals 11.22 gallons per minute. Six miner's inches would be an orifice that measures 6 square inches (2x3 inches or 1x6 inches).

It was simple and accurate; and a shining example of how an innovation from a bygone era can endure the test of time to be standard practice for the past 170 years.

miners by December of that year. “This was the first large ditch in successful operation in the county, and produced great results,” Lardner wrote. “Before that time the pay dirt taken from the Coyote lead had all to be hauled in cars to Deer Creek, at the foot of the town, at great expense: and piles of dirt had been left near the shafts on the hills, as useless, because it would

not pay to be hauled for washing. These piles of dirt now became valuable, as the water flowed by them, and thousands of dollars were washed out of them.”

Construction began in 1854 on an even-larger conduit, the Snow Mountain Ditch, with a capacity of 150 miner's inches, for a cost of \$360,000. Water was sold to miners for \$1 per miner's inch. Thanks to the water-hungry forty-niners, business was so brisk that construction costs were recovered within six weeks.

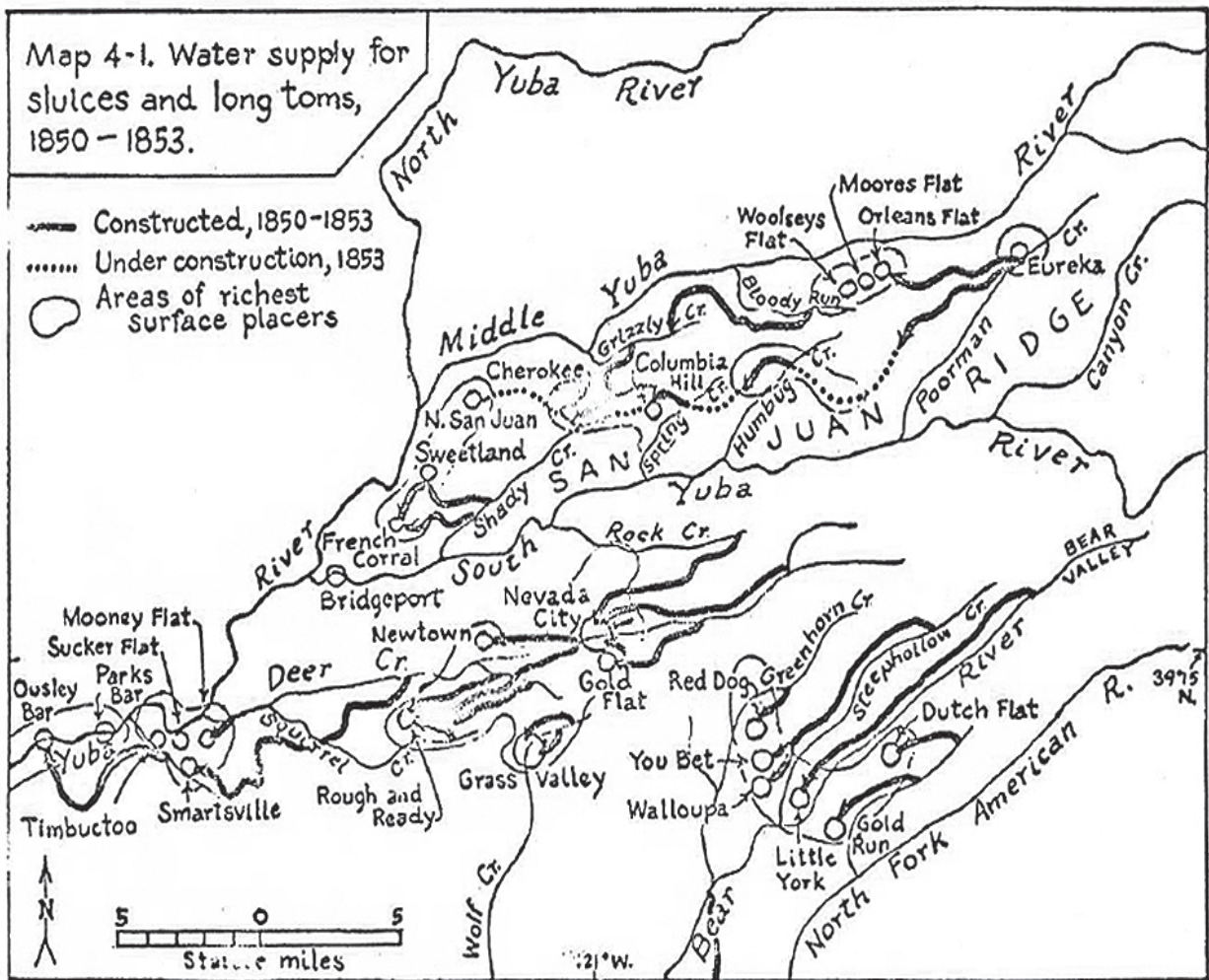
At the same time, William Harrison Folsom, who hailed from Portsmouth, New Hampshire, where he was an architect and contractor, traveled in 1849 to the Sacramento area and then to the town of Rough and Ready where he worked on water projects for the gold miners. As an architect he

designed a 9-mile-long canal from Deer Creek to a hydraulic mine near what today is Scotts Flat Reservoir and downstream to Coyote Diggings. Folsom got financing from a group of powerful San Francisco businessmen who became associated with the Spring Valley Water Company, which went on to hold a monopoly on water rights and became the major water supplier to San Francisco from 1860 to 1930.

Folsom wrote in his diary: “I went to Rough and Ready and went to mining and from there I went to Coyote Diggings. And in the spring of 1851, I organized the Deer Creek Water Company and we built a ditch nine miles long, one of the first enterprises of that kind in the section. I was one of the proprietors and superintendent of the work.”

Flumes were the primary ways to move water through the District.





Claiming the right to use the water

The right to use water quickly became an issue as miners and mining companies vied for the same source, and as more miners needed to tap and divert water from natural waterways to work their claims. The water itself could not be owned, but an individual could declare the right to take and transport water simply by posting a notice at the diversion point in a waterway. This was known as "first in time, first in right," and granted permission to the initial person to claim the water source. This principal became an important feature of modern water rights law, establishing the rules by which it is determined who can tap the water, as well as how much is allocated for given uses.

In November 1850, two rival companies began to construct ditches to convey the water of Deer Creek to Nevada City. The Deer Creek Water Company began its ditch at the upper end of the creek, while the Coyote Water Company began at the other end of town. Unfortunately, after

the completion of the ditches, the companies were involved in continual lawsuits as to the priority of rights. To avoid prolonged lawsuits, they consolidated in the fall of 1851.

The Deer Creek Water Company continued to be embroiled in controversy. Charles Marsh, owner of the Rock Creek Ditch Company, was furious over Folsom's new canal company bringing water to Coyote Diggings. Marsh felt that the mining law provided the greatest protection for his company serving the diggings, both the first to claim the water rights and for overall beneficial use. Marsh sued the Deer Creek Water Company, but the court battle lasted for only one year. As a result of negotiations, the two companies agreed to merge. The consolidated enterprise became prominent, using combined resources to provide more water to and further the mining interests in the region.

By 1853, primary water companies had emerged. Within a year, rivals Rock Creek and Deer Creek

Water Map
1850-1853



Hydraulic mining used high pressure streams of water to blast away mountainsides at Malakoff Diggins in North Bloomfield.

companies consolidated to the South Yuba Canal Company, which became a primary supplier of water for hydraulic mining. The company built an 18-mile-long segment of the vital South Yuba Canal from 1853-1857. Even today, the canal is important infrastructure that carries water from the high mountain watershed into the Nevada City and Grass Valley area.

In addition, ditches, canals and wooden flumes snaked down from the higher elevations of the Sierra, conveying water by gravity to the mining sites. Flumes were built where no common ditch could be dug, such as alongside granite peaks or within steep ravines: "Among the wonders which strike a visitor on first seeing the mining regions of California, are the lofty aqueducts, constructed on trestle-work, for the purpose of carrying the water across deep ravines," noted Prof. B. Silliman and George Black in *Prospectus – Eureka and Yuba Canal Company*.

By 1867, the mining ditches, canals and flumes spread over 850 miles; the cost of construction was \$4.5 million. In 1869 there were 120 canals in Nevada County, and by 1880 there were five large reservoirs and 1,000 miles of man-made waterways. The early basic ditches and flumes were augmented by a complex network of canals, pipelines and interconnections for hundreds upon hundreds of miles. Across deep canyons and hugging precipitous mountainsides, they brought billions of gallons of water to the mines. Reservoirs of all sizes that collected the snowmelt

and conveyed it downstream provided the source water. Among these were the Bowman Dam; three dams owned by the Milton Mining and Water Company, forming the English Reservoir; the Fordyce of the South Yuba Canal Company; and the Eureka Lake Dam of the Eureka Lake and Yuba Canal Company.

Hydraulic mining is highly effective – and destructive

This water infrastructure provided billions of gallons of water integral to supply the eerily effective technique of hydraulic mining that depended on high-pressure jets to blast rock and dislodge gold deposits. The technique was first used in 1853, after placer miners realized the more gravel they could process, the more gold they were likely to find. Hydraulic mining became the largest-scale and most lucrative form of placer mining of the day. It also was the most devastating.

Here's how it worked: Snowmelt from the higher Sierra elevations was diverted from dammed reservoirs into wooden flumes and ditches, and gravity did the rest. Cascading down the conduits, the water would reach a mining site, where it was channeled through heavy iron pipes to explode from a nozzle, known as a monitor. Appropriately resembling a cannon, a monitor could blast a mountainside with such ferocity it left huge craters. The technique was very efficient at getting to the gold. Although the first monitors were small and used canvas hoses, at the height of hydraulic mining in the 1860s an iron monitor could be 16- to 18-feet long and capable of blasting a stream of water to wash away the mountainside target. Once the rock, dirt and debris fell to the ground, miners washed the gravel through sluices laden with mercury, and the heavy gold settled behind what was known as riffle boards. While the gold separated nicely, the amount of leftover dirt and debris was immense. That "waste" washed into rivers and streams, where it eventually ended up downstream with catastrophic results to the environment and farmers' fields.

The rise of hydraulic mining secured more than 1.5 billion cubic yards of gold-bearing gravels from the 1850s to 1880s in the northern Sierra

Nevada region, according to the U.S. Geological Survey, and estimates indicate 11 million ounces of gold were recovered.

The technique required an incredible amount of water. For example, the largest hydraulic mine was Malakoff Diggins on the San Juan Ridge, which used 100 million gallons of water per day during the height of its production in the mid-1870s. The system required to get the water to the site was impressive. Snowmelt collected in Bowman Dam in the higher Sierra was directed into the North Bloomfield main ditch. The water then flowed 55 miles down a steep grade to the mining site, where it was contained in a storage reservoir. When needed, the water was directed down a penstock into an ever-narrowing channel through a canvas hose and forced through an iron monitor. The resulting high-pressure water jets scoured dirt and gravel from the mountain face, and the water-sediment slurry would flow into a sluicing system, extracting the maximum amount of gold before releasing the remaining muddy material into a natural waterway. Regrettably, the sediment would wash downstream, choking the

ivers and creating devastating damage to farmlands and riparian ecosystems.

Hydraulic mining came to an abrupt stop after one of the first environmental legal decisions in the United States in 1884. Two years prior, wheat farmer Edward Woodruff filed a suit against North Bloomfield Mining and Gravel Company on behalf of local farmers in the Central Valley. The lawsuit claimed the hydraulic mining operations resulted in the disposal of excess sediment and debris in local rivers and had destroyed a large portion of the valley's agriculture. Ninth Circuit Judge Lorenzo Sawyer ruled in favor of the farmers. The decision shut down the practice of dumping mining tailings into the Yuba River, which had destroyed farmland as far as 75 miles west to Sacramento. By 1900, the hydraulic mining operations had fallen silent.

Remaining was the vast infrastructure that had brought water to the mines. That infrastructure was the backbone of a water delivery system that would provide irrigation water to tens of thousands of acres of farmland and fields, as well as water for domestic use and drinking once the Nevada Irrigation District was formed. ■

