Transportation Development along the Feather River

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Gold Rush mining activities were the driving force behind early American settlement of the Feather River foothills. The earliest transportation networks connected mining camps to local markets, and from there to the wider world beyond. While many of the initial camps and the narrow mule trails that served them were abandoned, new corridors were opened up to service emerging rural settlement and towns, eventually evolving and adapting to technological advancements. Some of the resources remaining in the Lake Oroville area from this aspect of human activity are pack trails, roads, ferry and bridge crossings, and railroads. This paper focuses on the results of site-specific and general historical research into two aspects of transportation development in the region: mule packing and ferry crossings. The research contained here was undertaken by the Anthropological Studies Center at Sonoma State University for the Oroville Facilities Relicensing Project evaluation of Lake Oroville sites, specifically the Big Bend Mule Trail (CA-BUT-1864H) and the Oroville Ferry crossing (CA-BUT-69/H and -584/H).

Mules and Muleteers: Packing Supplies to the Diggings

The remoteness of the backcountry mining camps in California of the 1850s and 1860s created a great demand for goods and supplies in hundreds of places not reached by roads or navigable waters. Miners in the rugged mountain country needed food and liquor, clothing and bedding, tools, hardware, and other real or perceived necessities. The solution to this transportation problem was packing, or the use of mules, and occasionally horses, with packsaddles to carry the freight from the more-settled towns into the hinterlands. Even such heavy and bulky items as furniture, printing presses, and iron safes went up the narrow trails on the backs of mules. The mules were not limited to inanimate freight. Butte County historian George C. Mansfield points out that mule trains were also used for public transportation: "…the hurricane deck of a mule was a customary means of travel in the fifties" (Mansfield 1918:109). While jogging along a steep and narrow trail atop a mule may seem a rough and rustic way to travel, only the "more wealthy class of travelers were able to afford the luxury of a mule-back ride" (Thompson & West 1879:110).

The preferred animal for the packing trade was the Mexican mule. The Mexican variety was esteemed as stronger, tougher, and possessing much more endurance than its American counterpart. Presumably, Mexican mules were those that had actually been brought from Mexico, while American mules had been brought from the eastern United States. The supposed reason for Mexican mules' superiority as pack animals was that in Mexico, mules were used almost exclusively for packing, whereas American mules were traditionally used as draft animals behind the plow or wagon. The Mexican mule could reputedly carry up to 350 pounds to the American mule's 250, and get by on grass and one watering a day. When saddled, the Mexican mule was easier and less-tiring to ride (*Hutchings' California Magazine* 1856:114-115). Mules from other places were also brought to California. Gold Rush hopeful Alonzo Delano bought a dozen Peruvian mules and a "riding mule" in Marysville when he headed into the mountains to the Gold Lake country to start a store in 1849 (Delano 1854:334). The rapid influx of foreign gold seekers to California brought with it an influx of imported mules to transport miners, merchants, and their supplies. Although superior to horses for farm work, in 1863 mules were still scarce and expensive, and most farms used horses (Hittell 1863:229). This can be at least partially attributed to the large number of mules taken up by the packing trade.

In general, two men could manage a pack train, one in the lead and another at the end of the line. In the early days, Mexican *arrieros* (muleteers or "muleskinners") predominated in the pack trade (Bethel 1998:258). J. Ross Browne described Mexican mule drivers on the Washoe route into Nevada as *vaqueros*, or cowboys (Browne 1861:301-303). Mexican entrepreneurs also owned packing businesses: in 1853, 20 pack trains operating out of Marysville were Mexican-owned (Thompson & West 1879:110).

A brief review of the 1860 census for Oroville revealed that seven Chinese packers and a single Euro-American packer lived in the town (United States Bureau of the Census 1860). Chinese labor contractors were frequently merchants who sold food and other goods to their own crews as part of the contract. It is possible that these few Chinese packers in Oroville were carrying supplies from an Oroville-based Chinese merchant to Chinese contract labor crews at the mines.

An average pack train contained 40 to 50 mules, each loaded with from 200 to 350 pounds of freight. A "bell mule," often white, customarily led the column, the other mules being trained to start and stop when it did. Two kinds of packsaddles were in use: the wooden crossbuck type, and the Mexican *aparejo* style. The *aparejo* was a 25- to 40-pound leather pad stuffed with hair, heavier than the crossbuck but easier on the mules. As with the mules themselves, the Mexican version of the packsaddle was considered superior (Bethel 1998:258; *Hutchings' California Magazine* 1856:120-121).

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Loading the mules was a painstaking routine. Muleteers blindfolded the animals to calm them for loading, which required careful balancing and lashing of the sacks, barrels, and odd-shaped items that might make up the freight. It was normally mid-morning before the train could start traveling, which continued non-stop until sundown. After unloading by the *arrieros* at the evening's camp, the mules were hobbled for the night while they fed (on grass when in season, on barley carried along with the freight in the winter), watered, and rested. A frequently repeated bit of packing lore is that the mules would recognize their own packs by smell, and would locate and stand by the proper one in the morning for reloading (Bethel 1998:258; *Hutchings' California Magazine* 1856:114, 120-121).

Packing was a dangerous business—especially for the mules. Although the animals are naturally cautious, a shifting rock or collapsing trail edge might make a top-heavy loaded mule lose its balance and fall hundreds of feet down a mountainside. Rocks falling from above could also be deadly to mule and muleteer alike. Snowy winter conditions were especially treacherous, with the chance of avalanche or being snowed-in on the trail added to the other dangers. Attack and robbery of freight-laden trains also occurred (*Hutchings' California Magazine* 1856:117-118, 120). Passing another mule train coming from the opposite direction was usually not an easy proposition, sometimes requiring a mad dash to reach a wide spot in the trail in time to allow passing (Browne 1861:300-303).

Whiting & Company maintained a "man pack train" between the Buckeye Ranch in Yuba County and Quincy during the worst winter months in the late 1850s, using men with backpacks on snowshoes, primarily for mail delivery. Starting in 1857, Whiting initiated the "Dog Express" on that route, operating it for at least four years. The service used teams of four Newfoundland/St. Bernard-mix dogs to pull sleds with 250 to 500 pounds of freight and/or passengers into the snowy mountains (*Hutchings' California Magazine* 1859:134).

Each of the large mining areas in California developed its own centers and networks for packing supplies. In the 1850s and 1860s, the major supply centers were Stockton for the southern Sacramento District mines, Marysville (and to a lesser degree, Sacramento) for the northern Sacramento District mines, Shasta City for the eastern Shasta District, and Crescent City and Arcata for the western Shasta District. The numbers of animals employed in the trade provides an idea of its importance: in 1856 about 2,000 mules worked for Shasta packers and 1,500 for Crescent City packers; 1,500 were used in the Arcata trade in 1863. A weekly average of 200 tons of goods flowed out of Stockton on muleback in 1856 (Hittell 1863:71, 417; *Hutchings' California Magazine* 1856:114, 118).

PACKING TO THE NORTH FORK REGION

Packers based in Marysville dominated the trade with the mountain country to the east and north of Oroville. Although Oroville boosters insisted that their town was the head of navigation on the Feather River, the *de facto* head of navigation was Marysville, making it the regional hub of the packing trade. By 1853, 31 Euro-American individuals or companies were operating pack trains out of Marysville, in addition to the 20 Mexican-owned pack trains mentioned earlier. Marysville packers owned more than 4,000 mules, and more than 400 freight wagons based in the town plied the wider roads of the valley floor and foothills (Thompson & West 1879:110).

Much of Marysville's trade to northeastern Butte County and Plumas County went through Bidwell Bar, which became the county seat in 1853. Here pack trains and wagons from the south could cross the Middle Fork of the Feather River, at first over a floating log bridge, then on a ferry, and by 1856 on the new (toll) suspension bridge (Brown 1969:45-53). A trail had been established early-on from Bidwell Bar northward to Jack's Ranch, Berry Creek, and on to American Valley. In 1855 the route was resurveyed to improve the grade and the "Quincy Road" was built, allowing wagons and stages to reach as far as Walker's Plains, where muleback passenger trains took travelers farther into Plumas County (Mansfield 1918:182-183). Trade along the Quincy Road was considerable: in 1856 "an immense quantity of goods" was flowing from Bidwell to American Valley and to various branches of the Feather River (*Butte Record* 26 July 1856:4), and an 1857 letter to the *Butte Record* (16 May 1857:4) referred to the "seven or eight hundred pack mules" employed on the route.

CROSSING RIVERS IN THE GOLD COUNTRY

Rivers, both ancient and present-day, created the placer deposits that started the California Gold Rush and brought the masses of miners to its hills and mountains. When miners swarmed into the gold country, they found that its fast-flowing rivers not only contained much of the gold they sought, but also presented formidable travel obstacles. The initial solution to crossing a large river was usually a ferry. Early ferries became transportation focal points, drawing in the trails and wagon roads to converge on the crossings, with many of those routes, such as the Quincy Road, later evolving into modern highways (Bethel 1998:259). Bridges soon replaced most ferries at the same spots, although some river ferries, such as the Ord and Princeton ferries on the Sacramento River, persisted into the late 1960s (White 1969:14). When bridges occasionally washed out, ferries would temporarily reappear to handle transportation needs. The operation of ferries, which charged tolls for passengers, animals, and vehicles, offered a substantial economic opportunity for a small number of entrepreneurs with enough capital to get started in the business.

A ferry required a suitable location (preferably a relatively narrow point on the river without steep banks), a boat, a tethering system, and a means of motive power. The earliest ferryboats were often small skiffs or even wagon boxes detached from their running gear and pressed into this inland nautical service. German traveler Friedrich Gerstaecker crossed the Feather River at Long's Bar in 1849, describing the ferry then in use as a caulked-but-leaky wagon body big enough for four passengers, paddled across the river (Gerstaecker 1946:26). Larger barge-like craft were soon built to accommodate packed mules, horses, oxen, and freight wagons traveling the roads and trails (Bethel 1998:259).

A writer for an East Coast magazine recorded details of a ferry on the Connecticut River between Vermont and New Hampshire in 1900. Although on the other side of the continent, early western ferries were built by Easterners, and were undoubtedly similar in many respects to those in the East. The Vermont ferryman of the magazine article had been laboring at the spot since 1858, and the technology had apparently remained more-or-less unchanged from that time; this ferry was "typical of all those on the river" (Thrasher 1900:660). Travelers on the opposite bank summoned the ferry by a blowing a tin horn that hung on a tree. The crossing made use of two boats, a small flat-bottomed skiff, rowed across for pedestrian passengers, and a "big, shallow scow" for wagons and buggies, their teams, and other livestock. This larger ferryboat was 40 feet long by 11 feet wide by 20 inches deep, built of pine planks, and with a service life of about 20 years. Both ends sloped upward, with hinged three-foot-wide aprons that were lowered for loading and unloading. No wharf or landing structure was used: the boat was merely run up to the bank and the hinged loading ramp let down. A heavy steel rope made up of 3/8-inch wire stretched from shore to shore at the 400-foot crossing, secured at each end by wrapping around several trees and posts. The cable was lowered beneath the surface when not in use, presumably so it would not interfere with other navigation on the river, and required replacement about every four years. The ferry was attached to the cable with two pulleys. The old ferryman propelled the boat by grabbing the cable at the forward end and walking slowly aft, returning forward to repeat the procedure as many times as needed to get across. For the transport of livestock, eight cows were considered a load—the boat could hold more, but if too many were taken on, the animals might panic and either push each other over the side or unbalance and sink the ferry. Sheep were considered more troublesome than cows. The boat could take on 100 sheep at a time, but they were more skittish and apt to jump overboard (Thrasher 1900:659-660).

Samuel Ward, the down-on-his-luck son of a wealthy New York family, came to California in 1849 and again 1851 in attempts to regain his depleted fortune. He became involved with the management of a Merced River ferry in 1851 and wrote of it and other adventures in memoirs originally published in 1861 and 1862 (Ward 1949). While Ward gave few details of the ferry's actual operation and did not describe its motive power, his description of the wrecking and rebuilding of the boat provides a glimpse into ferry construction. Destruction of ferryboats due to periodic floods on California rivers was probably not an uncommon experience for ferrymen. Ward's boat was destroyed and swept away during an October storm, leaving nothing to do but build a new boat from scratch. The wreck was located and stripped of usable lumber and hardware ("spikes and bolts"). The two carpenters who undertook the job also whipsawed some new lumber needed for the boat (Ward 1949:113-123). Ward himself traveled to nearby Quartzburg to have additional hardware fabricated by a blacksmith whose workshop was attached to a stamp mill. The needed items consisted of various bolts, pins, and rings, along with "the heavy hinges destined for the moveable flaps at either end of the boat, as well as certain iron knees for bracing up her sides." Also purchased was "a new coil of heavy cable" (Ward 1949:113-123,124,127). As heavy fiber rope was sometimes called cable, it is unclear whether wire or fiber rope was used here. Ward and his associates launched the reincarnated ferry 23 days after the loss of the old one.

Ferries in various parts of the world have used a variety of power sources, from the simple man-pulling-a-rope of the Vermont example to horse-powered treadmills to later steam and gasoline engines. The primary propulsion method on northern California's fast-flowing rivers seems to have been to use the force of the current itself to move the ferries. An 1894 passenger crossing on the "large flatboat" of the Pit River ferry near the McCloud River confluence wrote that it operated "…by means of a wire cable suspended from shore to shore, with a wooden block of ingenious make, to which the boat is attached by a strong rope, the swift current furnishing the motive power" (Eames 1894:235). The original Ord ferry, like others on the Sacramento River, "was powered by the river current," lowering a "splashboard" into the river for crossing. Tethered to a cable across the river, a rope and ring tied to the ferry "…kept the ferry on track" (White 1969:12). Mansfield (1918:110) gives the average size of ferries in Butte County as 12 feet wide by 60 feet long, and states that they "…were propelled by the current and controlled by ropes" (Mansfield 1918:110).

The Oroville Ferry

The study found historical evidence for at least 20 ferries around Butte County. John Elder obtained the first license for a ferry at Ophir (Oroville) on 6 April 1852. George J. Vaughn, who owned his own boat for crossing over to his mining claim, frequently found himself giving free rides to those wishing to avoid paying to cross on Elder's Ferry. Tiring of this trend and taking advantage of the circumstances, Vaughn got his own ferry license and began operating a public ferry "a few rods above the present bridge-site" on 7 June 1853 (Wells and Chambers 1882:235). On 7 June 1854 D. C. Downer applied to the Court of Sessions for the Oroville ferry license, having purchased the ferry from George Vaughn. During this same court session, Vaughn's partner G. P. Carlton also applied to obtain a ferry license, for a spot near his store south of town at Bagdad. Downer registered his opposition to the Bagdad ferry, as it was too close to the Oroville ferry. Later that month the Court granted one-year licenses to both Downer and Carlton. Henry B. Lathrop, first a partner of Downer, obtained the Oroville Ferry license on his own on 14 May 1857 (Butte County Administration Office [BUT-AO] 1860: 4, 11, 14-15, 213). The ferry continued to serve the public at the spot until the first bridge was completed in early 1872.

Oroville Ferry Systems: Two Designs

The 1860 Scott & Henning *Official Map of the Town of Oroville* depicts two ferries that were in use at the time of the map survey. At the northeast end of town is the Oroville Ferry, under H. B. Lathrop's ownership at the time. Southwest of town is G. P. Carlton's Bagdad Ferry. Beyond just marking the locations of the two ferries, the surveyors John Scott and J. W. Henning actually showed the cable system used at each crossing. A close look shows that the ferries used two very different systems (see figures 1 and 2). Both systems are designed to use the river's current as the motive force, but they use different methods of holding the ferry against that current and guiding it across the river.

Research showed that they are representative of the two main designs of current-powered ferries, often referred to as "flying bridges." The long, narrow shape typical of Butte County ferryboats is the ideal configuration for current-driven ferry designs. The use of flying bridges of various types was a frequent stream-crossing strategy in nineteenth-century military operations (see *Chambers' Encyclopædia* 1872:301; Halleck 1862:353-354; Haupt 1864:203-205).

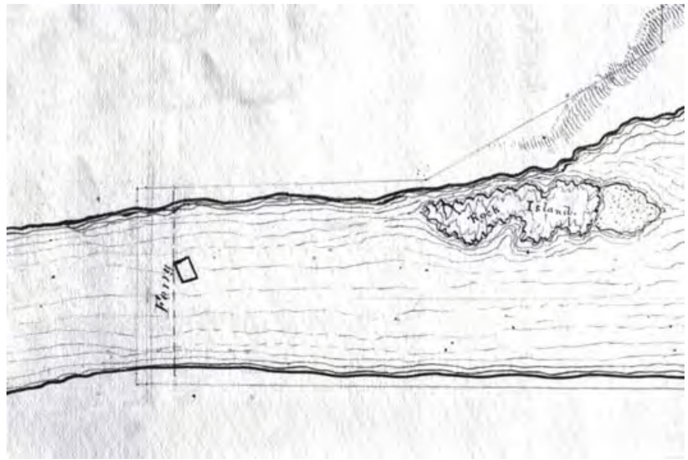

Figure 1: Detail from the 1860 Official Map of the Town of Oroville*, depicting the main Oroville Ferry across the Feather River. The current flows from left to right, and the ferry would be propelled from bottom to top as pictured in this view (Scott & Henning 1860).*

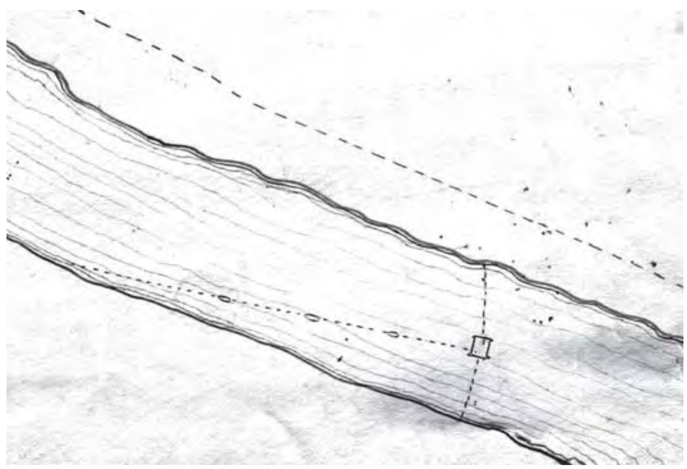

Figure 2: Detail from the 1860 Official Map of the Town of Oroville*, depicting the Bagdad Ferry across the Feather River at the southwest end of town. It shows a long "pendulum-style" cable supported by three floats (Scott & Henning 1860).*

The map shows the Oroville Ferry (Figure 1), just upstream from the "rock island" that would provide a footing for the later bridges, attached at an angle to a cable or chain running directly across the river. That the mapmakers have drawn the ferry at an angle is an important detail. If tethered to the cable at both ends with ropes and pulleys or "travelers" (moveable rings) holding the ferry at the appropriate angle to the current, the force of the current pushing against the side of the vessel will move it forward, much as the wind against an angled sail moves a sailboat. The cable and the traveler tethers keep the ferry from floating downriver and limit it to movement back and forth across the river. That resistance, in combination with the current's force against the angled hull, results in the forward motion. According to an 1864 military engineering treatise, the optimum angle for a flying bridge ferry is 54 degrees 40 minutes from the direction of the current (Haupt 1864:203). A traveler tether at each end of the boat on the upstream side can be lengthened or shortened to achieve the correct angle, and to reverse the angle for the return trip. As described above, the Ord Ferry on the Sacramento River used a "splashboard" that was lowered into the river to increase motive power. A photograph of the ferry reinstated at Oroville after the 1907 bridge washout shows one of the two moveable end "flaps" or loading ramps lowered into the water, presumably at what was the stern when the photo was taken. This appears to be intentional, to increase the current's propulsion of the boat.

The Bagdad Ferry, as shown on the map (Figure 2), represents the other kind of flying bridge. In this arrangement a long cable or chain is attached at the upstream end to a fixed point on the bank, and at the downstream end to the ferryboat. The current again supplies the motive force, but in this case the ferry swings pendulum-like in an arc across the river, similar to a water skier cutting across the tow boat's wake. A long cable is required, to achieve large-radius arc and minimize the curvature of the ferry's path across the width of the river. A short cable would create a short-radius arc, resulting in the need to move increasingly against the current near both riverbanks as the arc curves back upstream. A cable long enough to create a large-radius arc needs to have floats or buoys attached to keep it on the surface of the river (Haupt 1864:204). The map depiction seems to show three such buoys on the long cable. The arc of the ferry's path across the river is also drawn. The upstream attachment for this type of flying bridge is often made to a rock or anchor in midstream. If bank and current flow conditions are right and the line is long enough, however, the fixed point can also be at the river's edge, which is the case at the Bagdad ferry. Since the ferry is traveling through the river's current on an arc, its angle in relation to the current direction is constantly changing. To maintain forward motion, some means of adjusting the angle as the crossing is made is therefore needed. This is achieved by attaching the long cable to the boat with an adjustable arrangement of tackles and pins, and sometimes assisted by the use of a steering oar (Haupt 1864:210).

GOVERNMENT REGULATION OF FERRIES

According to common law in the United States, ferries were considered integral parts of public highways, and so came under the same governmental authority as the highways. In return for maintaining the appropriate services and facilities mandated for public travel, ferry operators were allowed to charge tolls, as well as enjoy a certain amount of protection from competitors. They were at the same time private and public endeavors: they were private businesses fulfilling a public function. The government set toll rates and required the posting of bonds by the operators, to give added protection to the public against any loss incurred while using a ferry (Angell and Durfee 1857:412-417).

In Butte County and elsewhere, this government regulation of ferries and toll bridges took the form of franchises approved, licensed, and regulated by the county. Ferry operators and bridge builders were required to post and publish their intentions in advance of applying for a license to operate a crossing at a given location. Likewise, revocation of a license also required posting and publishing 40 days in advance to prepare the public. In addition to paying licensing fees, applicants for licenses had to post bonds stipulated by the county, which granted the ferry licenses for periods of six months or a year. Ferry tolls were also regulated by the county; fees authorized for the main Oroville ferry on 17 May 1855 were as follows (BUT-AO 1860:57):

Footman	$0.25
Man and Horse	$0.50
Packed animal	$0.30
Single animals	$0.25
Loaded and empty wagon with 1 span	$1.00
Additional span	$0.50
Buggy and single horse	$0.75

The Board of Supervisors ruled on 13 Aug 1855 that no additional ferries or bridges could be licensed within one mile of existing ones until their licenses expired (BUT-AO 1860:76). Legal wrangling between competing ferry interests was not unusual, further evidence of the lucrative nature of the business. As a result of the tight government regulation and the economic importance of the ferry crossings, the modern researcher can expect to find a relative abundance of evidence of them in the historical record.

Relating the Research to the Resources

Three out of the ten transportation-themed sites evaluated for the Lake Oroville Project have been identified as pack or mule trails. One of these, the Big Bend Mule Trail, is a truly spectacular collection of surviving segments of an approximately 18-mile-long trail around the Big Bend curve of the North Fork of the Feather River. Along this stretch of river was a chain of placer bars that saw much early mining activity. The trail, often supported by well-made, stacked-rock retaining walls, hangs on the edge of the steep canyon, winding up and down through the barren lake fluctuation zone between the modern vegetation line and now-submerged placer bars (Figure 3). An 1886 newspaper article linked the trail's construction to the activities of the Big Bend Tunnel and Mining Company, which would date it to the early 1880s (*Oroville Mercury* 7 May 1886:3). While this explains the abundant careful and labor-intensive stonework, overall research points to an interpretation wherein the tunnel company probably refurbished and improved an existing trail that had developed earlier to serve Gold Rush-era placer bar camps. Contextual and particular research helps understand the nature of the trail's origins, use, and importance, suggests possible ethnic associations of users, and in the future may aid in the interpretation of artifacts and trail features.

Most of the archaeological remains associated with the two landings of the Oroville Ferry crossing (recorded as two sites, CA-BUT-69/H and -584/H) consist of a confusing assortment of 16 iron eyebolt attachments of various kinds (for cables or chains) affixed to bedrock outcrops and boulders (Figure 4). Almost all were set into drilled holes

Figure 3: Running across the center of this photo, a surviving segment of the Big Bend Mule Trail is anchored to what is now the exposed bedrock of the Lake Oroville fluctuation zone. Inset enlargement shows detail of the carefully built stacked-rock retaining wall supporting the trail. The wall is roughly five feet tall at its highest point (Anthropological Studies Center photo).

Figure 4: Close-up of two eyebolts embedded in bedrock at the Oroville Ferry site (Anthropological Studies Center photo).

with melted lead poured around them. The exposed lead around the bolts frequently shows marks of having been peened or chiseled to further tighten the connection. A description of this kind of bond as it was used to attach cables for the nearby 1856 Bidwell Bar Bridge identifies a unique source for the lead used in that case: "The ends of the cable were embedded in solid rock, around which melted lead was poured to hold the cables in place…The lead used to hold the cables in place was melted from lead foil taken from discarded tea boxes from the Chinese store at Bidwell's Bar…The lead foil was collected by William and Alfred Clark and sold to the bridge contractors for 25 cents a pound" (Boyle and Dolan 1943:7). Given the large Chinese presence in and around Oroville in the 1850s, it is probable that the lead for the ferry moorings came from the same readily available source.

Part of a massive iron bar-link chain was also found near the river's edge; its exact purpose is still unknown (Figure 5). Intermixed with the ferry features are the remains of two early bridges, a standing historic-era bridge, a modern highway bridge, and numerous prehistoric bedrock mortar features. In addition, some large concrete features and more-modern cable moorings are also present; these were explained when research found that a 1960s railroad bridge also had crossed through the site, for trains bringing dredge tailings from downriver to build the Oroville Dam upstream. Site-specific research indicated that the ferry franchise had changed hands frequently, and due to periodic floods the spot was likely to have been the site of a series of ferries, perhaps with several different configurations, rather than a single continuous ferry. General research into ferry technology revealed the two main types of current-powered designs, which were both found to be represented on the 1860 map. While that map clearly shows the type of ferry in service on the site at that time, it will be up to future study to make sense of the array of eyebolts found (the Bagdad Ferry site is not within the project area, and was not examined). As a side note to the ferry research, some historical evidence was also found indicating that hand-forged eyebolts can be sorted into "old-type" and "new-type" designs, offering at least the possibility of relative dating. While the general contextual information generated by this study is important for evaluation purposes, it also has, along with the site-specific research, great potential to help ultimately understand the mechanics of the ferry-crossing remains.

Figure 5. Massive forged bar-link chain at the Oroville Ferry site. The purpose of this artifact has not yet been determined (Anthropological Studies Center photo).

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