PREHISTORIC AND ETHNOHISTORIC RESEARCH ISSUES
(by William Hildebrandt and Sharon Waechter)

The prehistoric sequences proposed for the project area (see the *Prehistoric Context* section, page 29) isolate the major trends exhibited by both the local and regional archaeological records. They also reveal a series of research issues or themes that range from interesting hypotheses in need of further evaluation, to major gaps in the archaeological record that need to be filled. Focusing on these research issues in the future will not only improve our knowledge of the past, but will also assist in determining the significance of archaeological sites based on their ability (or inability) to address them.

We discuss ten research issues, including: *Controlling Chronology*; *Identifying the First Colonizers of Northern California*; *Origins of Acorn-Salmon Economies in Northern California*; *Evolution of Milling Tools and Features*; *Inter-Regional Exchange*; *Rock Art*; *Historical Linguistics and Population Replacements*; *Pyrodiversity as a Land-Use Management Strategy*; *Native American Rock Features and the Spiritual World*; and *Native Responses to Contact*. This list is by no means exhaustive; rather, it focuses on the most current and significant topics within the larger region, and those which can be addressed with archaeological data sets that are known or likely to occur within the study area.

CONTROLLING CHRONOLOGY

In the most general terms, the issue of chronology is concerned with the temporal ordering of archaeological data in terms of either absolute or relative time, and in the refinement of local and regional cultural-historical sequences. As such, chronological concerns represent an essential prerequisite to the investigation of all "higher-order" research questions having to do with diachronic changes in human behavior. Two chronological topics were identified as especially significant to this study: refinement of regional projectile point sequences, and development of obsidian-hydration age-conversion equations for certain widely used geochemical glass types. Shell beads and a variety of other ornaments are also important tools for controlling chronology, but they are discussed under *Inter-Regional Exchange* (page 76).

Projectile Point Chronologies

As outlined in the *Prehistoric Context* section above, multiple projectile point sequences exist within the current study area. The Upper Klamath Zone has strong affinities with the northwest Great Basin (e.g., Clovis, Great Basin Stemmed, Humboldt Concave-base, Northern Side-notched, Elko, Rosegate, Desert Side-notched) and, to a lesser extent, influences from the Klamath Basin (e.g., Siskiyou Side-notched) and northern California (e.g., Tuluwat Barbed [formerly Gunther Barbed]; Figure 12). As a result, researchers working in this zone can rely to a large extent on the most recent syntheses provided by Hildebrandt and King (2002), and subsequent contributions from Hildebrandt and King (2012), Smith et al. (2013), Hockett et al. (2014), and Smith et al. (2014).

Moving to the Sacramento Valley, especially the upper Sacramento Valley in Tehama and Shasta counties, the projectile point sequence provided by Sundahl (1992; see also Basgall and Hildebrandt [1989]) remains quite viable (e.g., Clovis, Borax Lake Wide-stemmed, Squaw Creek Contracting-stemmed, Clikapudi Side- and Corner-notched, Tuluwat Barbed, and Desert Side-notched). The main problem with this sequence is the approximately 3,000-year void between Clovis and Borax Lake Wide-stemmed. This void also occurs in the North Coast and Klamath Mountains/North Coast Ranges zones and is discussed in more detail below (see *Identifying the First Colonizers of Northern California*, page 72).

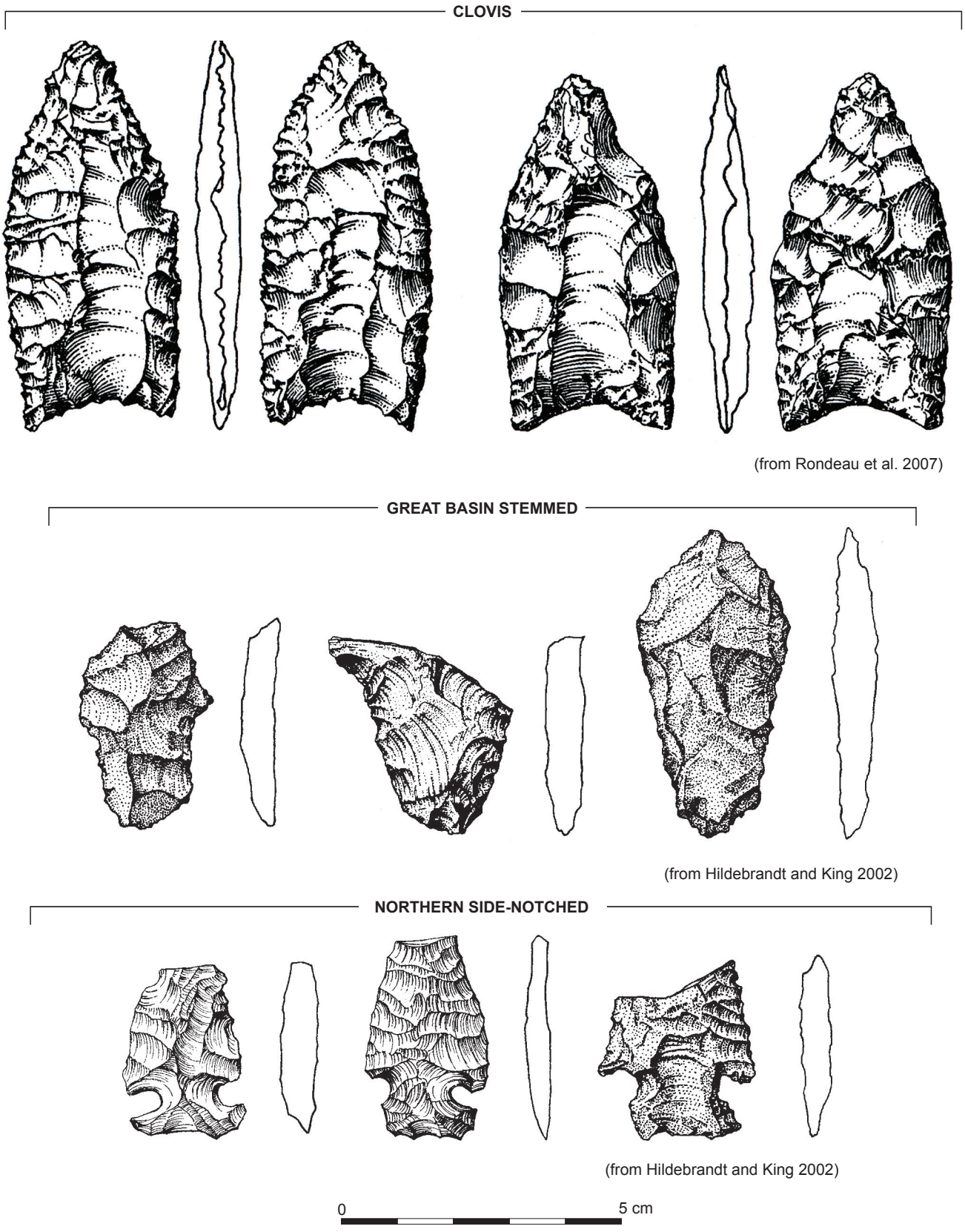

Figure 12. Regional Projectile Point Types (1 of 4).

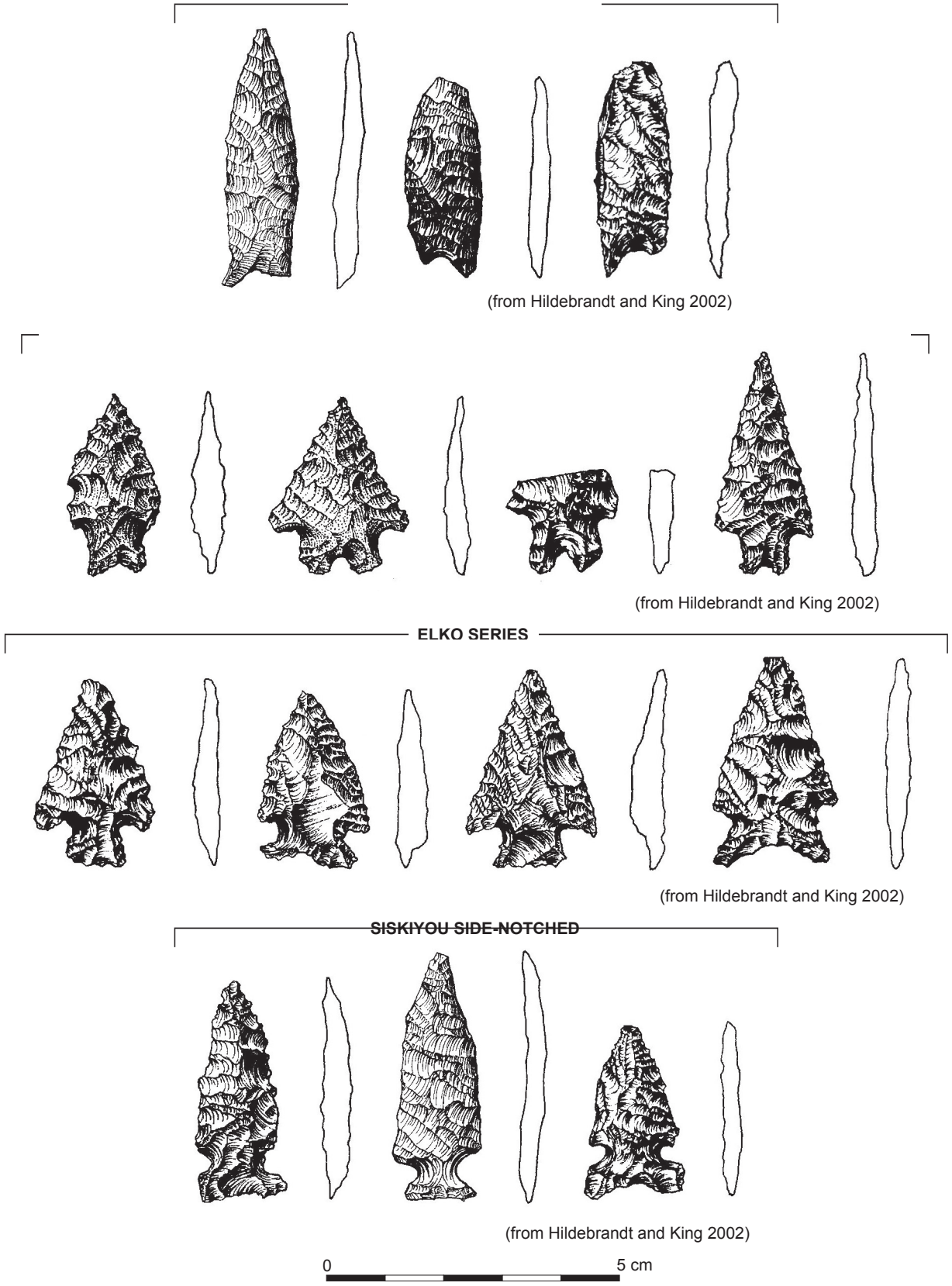

Figure 12. Regional Projectile Point Types (2 of 4).

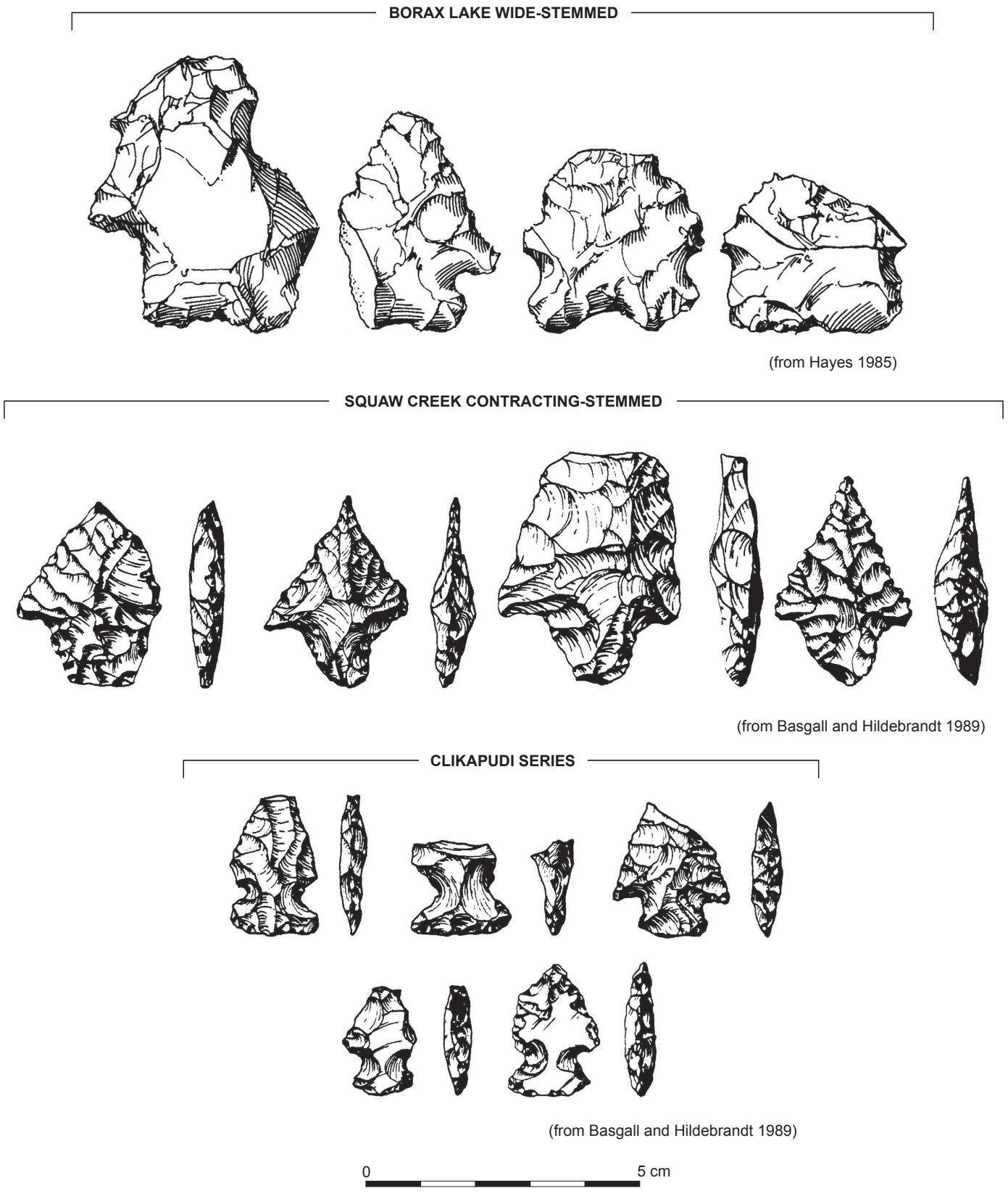

Figure 12. Regional Projectile Point Types (3 of 4).

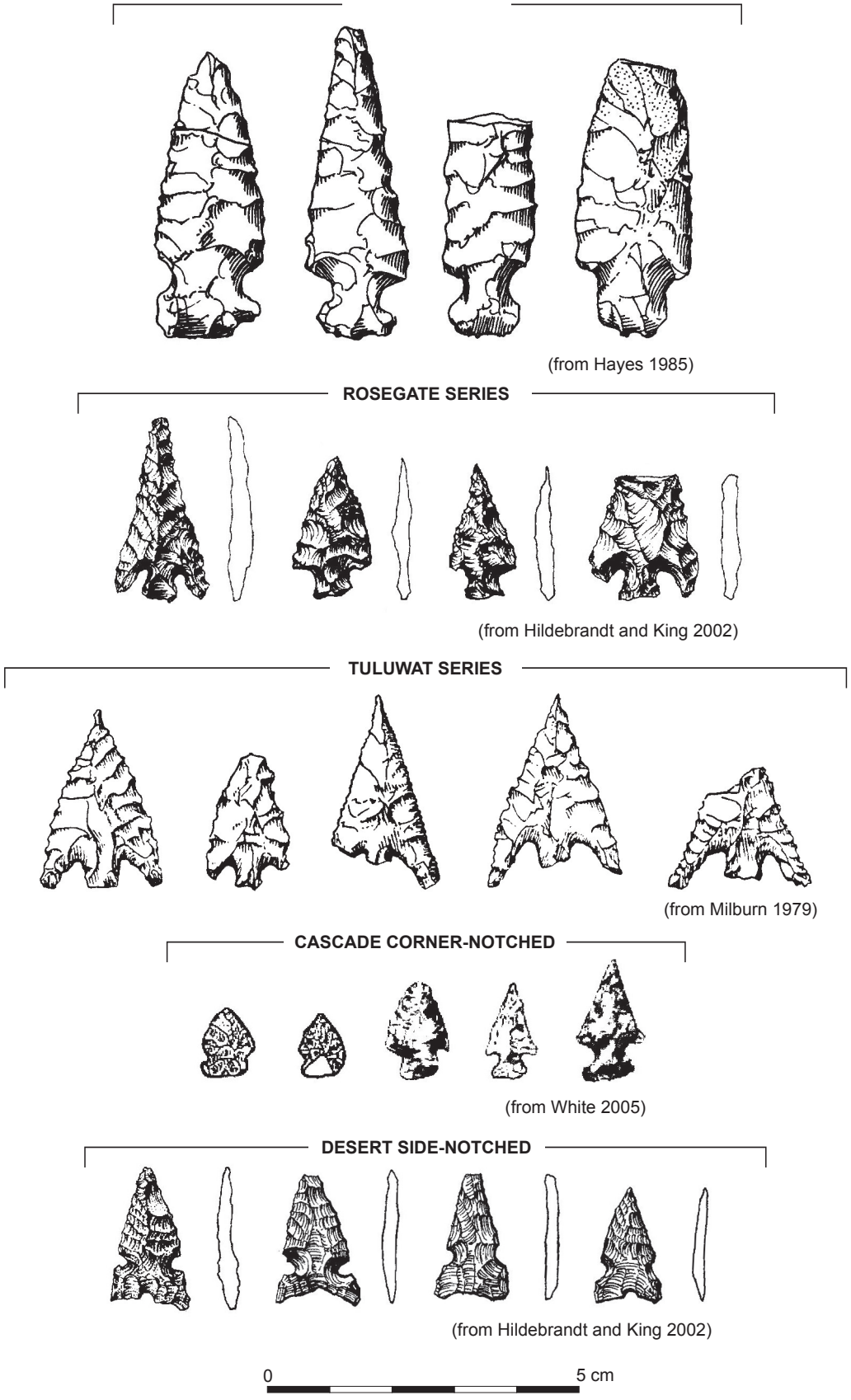

Figure 12. Regional Projectile Point Types (4 of 4).

The southernmost end of the North Coast and Klamath Mountains/North Coast Ranges zones, especially ancestral Northern Pomo lands, has strong cultural affinities with the Clear Lake Basin. As a result, the comprehensive projectile point sequence developed by White et al. (2002) should be applied to these locations.

Chronological patterns become much more problematic when moving north, as the availability of high-quality archaeological data is significantly reduced in many areas. Based on what we do know, it appears to begin with Clovis and Borax Lake Wide-stemmed (and the aforementioned gap between the two), but what comes next (i.e., between about 5700 and 3200 cal BP) remains an open question. The lack of a clear temporal indicator dating to this interval led Hildebrandt (2007:89) to extend the Borax Lake Wide-stemmed forward in time, hypothesizing that it may have been a holdover within this portion of the state. This was probably incorrect, as it seems more likely that this interval was filled by Squaw Creek Contracting-stemmed points (as in the upper Sacramento Valley); these points exist in the mountains of northwest California but have not yet been found in well-dated, single-component contexts.

It is also important to note that Jensen and Farber's (1982b) excavations at the confluence of the North Fork and Trinity rivers revealed a deeply buried deposit containing large side- and corner-notched points. They hypothesized that the component dated to between 5700 and 4500 cal BP, which would also fill this problematic time period.

Between about 4500–1500 cal BP things become clearer, with the interval filled with Mendocino-series projectile points (largely corner-notched dart points). These are quite similar to the Clikapudi series, and may differ in name only. After 1500 cal BP, the Tuluwat Barbed points take over. Unlike areas to the east, however, Desert Side-notched points do not make it out to the north coast.

There is not a clear projectile point chronology for the Sierra Nevada and adjacent lowlands. Early workers in the region (e.g., Kowta 1988; Markley 1980; Ritter 1968, 1970) have proposed local sequences along with probable projectile point types that go with each time period (see the *Prehistoric Context* section, page 29), but more recent researchers in the region have called into question the utility of this work. Delacorte and Basgall (2006:35), for example, state that the projectile point chronologies proposed for the Lake Oroville vicinity and surrounding areas "have not proven particularly useful…for establishing more than coarse-grained temporal controls" (see also Delacorte and Bethard 2015). They also note that "Although some of the points appear to conform to types or categories previously defined in other regions (Gunther, Desert Side-notched), it would be imprudent to assume that their cultural or temporal significance is necessarily the same" (Delacorte and Basgall 2006:72).

These chronologies do provide temporal ranges for five categories of points that are commonly found in the area. They include large corner-notched (5000–1300 BP), large stemmed points (5000–1300 BP), small corner-notched points (1150–450 BP), small stemmed points (that look like Tuluwat Barbed, 1150–450 BP), and small side-notched points (that look like Desert Side-notched, 450–120 BP). These temporal ranges are fully consistent with the small sample of projectile points recovered from White's (2003) excavations along the Colusa Reach.

Moving up to the Southern Cascade Foothills, the White et al. (2005) study in Lassen National Park simplifies a series of previous projectile point sequences where a multitude of types were proposed (e.g., Dugas 1995; Greenway 1982; Johnson and Theodoratus 1984a). The White et al. (2005) provisional chronology includes Wide-stemmed 10,500–7500 cal BP, Stemmed (5000–3500 cal BP), Contracting-stemmed (3500–2200 cal BP), Corner-notched (3500–1100 cal BP), Large Gunther/Tuluwat (1100–650 cal BP), Small Gunther/Tuluwat (650 BP – Contact), Cascade Corner-notched (650 cal BP – Contact), and Desert Side-notched points (350 cal BP – Contact).

Finally, Cleland's (1995) findings farther north in the Southern Cascade Foothills at Lake Britton appear to reflect influences from both California and the Great Basin. His earliest phase of occupation (8300–5700 cal BP) is represented by what he calls Clikapudi Side-notched, but given their great age at this location (much older than in the upper Sacramento Valley where the type was first identified; Sundahl 1992), it seems they have a greater linkage with Northern Side-notched points and the Great Basin region (as well as with our Upper Klamath Zone). They continue through the 5700–4300 cal BP phase, during which Clikapudi Corner-notched points are added, which might also be thought of as Elko (note also the absence of contracting-stemmed points which are found in all the other California sequences). Both forms continue forward into the 4300–3200 cal BP phase, but the side-notched points drop out after 3200 cal BP. Finally, a clear California influence comes in sometime between 2000 and 900 cal BP with the Gunther/Tuluwat Barbed, and the Desert Side-notched arriving later.

Data Requirements

Projectile point sequences are always a work in progress, especially in regions lacking deeply stratified sites with strong associations between well-defined types and radiocarbon dates. It follows, therefore, that future researchers should recognize the data gaps outlined above (and others), and do their best to fill them. The best approach is to isolate single-component assemblages and their associated projectile points, and date them with radiocarbon. If obsidian artifacts are also found in these contexts, they need to be subjected to geochemical sourcing and hydration analysis, so that we can improve our ability to develop accurate hydration rates for the various obsidian sources that were used throughout northern California. Finally, it is also important to build on the source-specific hydration database that already exists for individual projectile point types, as these findings will also improve our ability to control time in the archaeological record.

Obsidian Hydration

Source-specific obsidian hydration has been a very important tool for developing almost all of the chronological sequences reviewed in *Prehistoric Context* (page 29). The primary obsidian sources used for this purpose in the current study area are from the Medicine Lake Highlands, Tuscan, Borax Lake, and Napa source groups. Medicine Lake Highlands (predominately the Grasshopper Flat/Lost Iron Wells/Red Switchback subgroup) and Tuscan are the most commonly found obsidians in the study area, especially in the more northerly areas. Basgall and Hildebrandt (1989) originally proposed hydration rates for both of these source groups based on associations with radiocarbon dates. These constructs have seen relatively good success when applied to a variety of locations, but subsequent improvements have been made by a variety of researchers, the most important being Bayham and Johnson (1990) and Whitaker et al. (2009).

Borax Lake and Napa obsidian tend to occur in the southernmost parts of the study area. The most useful hydration rate for Borax Lake obsidian has been proposed by White et al. (2002). Origer's (1982) rate for Napa has also seen long term utility, but Rosenthal's (2005) more recent contribution is an improvement on this original work.

Data Requirements

Similar to projectile points, obsidian hydration rates should always be considered an ongoing research concern. Whenever possible, it will be useful to develop additional radiocarbon-hydration pairings to improve the databases used to develop the existing rates and, if appropriate, propose a new, more accurate rate for a particular obsidian source. It will also be important to control for differences in local temperature, and how depth of deposit influences this variable. Rogers and Yohe (2016, and references therein) provide guidance in this regard.

IDENTIFYING THE FIRST COLONIZERS OF NORTHERN CALIFORNIA

Clovis projectile points are sparsely scattered across northern California, with a significant number falling with the current study area. They date to between 13,400 and 12,800 cal BP (Haynes et al. 2007), and have long thought to be the oldest evidence of humans in North America. More recently, however, findings from the Paisley Caves in southern Oregon show evidence for people dating back to between 14,500 and 14,100 cal BP, and this component appears to have a Great Basin Stemmed projectile point with it (Jenkin et al. 2012). These findings give support to the hypothesis forwarded by Beck and Jones (2010, 2012) that there were people here before Clovis, and that Clovis was an in-situ development that probably originated east of the Rocky Mountains.

Beck and Jones have further hypothesized that the pre-Clovis people may have entered North America via a coastal route, and moved into the interior along large drainage systems like the Columbia River. Although coastal data capable of testing this proposal are difficult to come by due to Holocene sea level rise, and pre-Clovis radiocarbon dates have yet to be found in these locations, some of the oldest radiocarbon dates from California do come from the Channel Islands (e.g., 12,900 cal BP; Johnson et al. 2000; Rosenthal and Fitzgerald 2012). It is also important to note that obsidian hydration data from the Clear Lake Basin, including the Borax Lake Site, provide hints of pre-Clovis activity (White 2013).

So if there was a pre-Clovis coastal entry into California, and this entry and dispersal could be marked by Great Basin Stemmed projectile points, it makes good sense to search for Great Basin Stemmed projectile points within the current study area and attempt to determine their actual age. Significant headway has already been made by Meyer (2013), as he has mapped out the geographic distribution of Clovis, Great Basin Stemmed, and Borax Lake Wide Stemmed points throughout northern California. What he found, however, is that almost all of the Great Basin Stemmed points are found in northeastern California associated with old pluvial lake basins (e.g., Butte Valley), while almost all Borax Lake Wide-stemmed points are found in the west, often in upland habitats.

The fact that Great Basin Stemmed points are essentially absent from northwestern California does not necessarily reject the hypothesis that pre-Clovis people came down the coast and later dispersed into the interior, but it certainly provides no support for the idea. It is also important to emphasize that the oldest post-Clovis temporal indicator in northwest California—the Borax Lake Wide-stemmed—has a maximum age of about 10,000 cal BP at Clear Lake (White 2013) and, perhaps, somewhat later farther north. This leaves at least a 3,000-year gap between Clovis and Borax Lake Wide-stemmed for which we have no temporal indicator in the current study area.

Data Requirements

So what fills the 3,000-year void between Clovis and Borax Wide stemmed points in the current study? Part of the early end of the gap could be filled with Clovis points, as Beck and Jones (2010, 2012) argue that the western versions of the type persisted longer than they did in their point of origin in the southern plains (see also Rondeau et al. 2007). With regard to the later end of the gap, it is possible that we are underestimating the age of Borax Lake Wide-stemmed points. The fact that many of them have large basal thinning flakes reminiscent of fluting could indicate a technological linkage between Clovis and Borax Lake Wide-stemmed, and a chronological one as well (White 2013).

If it is not the Borax lake Wide-stemmed, what could it be? One possibility is Cascade points. They are laurel-leaf-shaped (lacking stems), and either bipointed or with slightly rounded bases. These points are commonly found in the Pacific Northwest and on the Columbia Plateau (including southern Oregon; Ames et al. 1998; Connolly 1988), and may be chronologically equivalent to Great Basin Stemmed points found farther to the east. Because they lack obvious diagnostic features, they could exist

in northern California assemblages and have yet-to-be-identified potential as late Pleistocene-early Holocene temporal indicators.

It follows, therefore, that future researchers should recognize this important gap in the northern California archaeological record, and search existing and newly discovered assemblages for potential artifact forms that can fill it. Clear descriptions of these artifacts should be made, and they should be dated with radiocarbon (if good associations exist) or source-specific obsidian hydration readings whenever possible.

ORIGINS OF ACORN-SALMON ECONOMIES IN NORTHERN CALIFORNIA

The ethnographic review (see *Ethnographic Context*, page 91) reveals that harvest and long-term storage of acorns and salmon were major economic pursuits among the majority of people living within the project area. A review of the archaeological record, however, shows a great deal of geographic variability in how and when this system developed. Tushingham (2009, 2013), for example, found that the intensified use of the two resources was not synchronous in northwest California. Instead, it appears that even though high levels of residential stability developed in the lowlands at around 3100 cal BP (as evidenced by house floors, a full complement of flaked, battered, and ground stone tools including mortars and pestles, and charred acorn remains; also see Hildebrandt 2007), fishing gear and salmon bone were not found in meaningful amounts, probably reflecting a more casual use of the fishery at the time. After 1500 cal BP, the frequency of both fishing gear and salmon bone increased significantly, and seemed to reflect the economic system observed during ethnographic times.

Tushingham (2009, 2013; see also Tushingham and Bettinger 2013) proposed that this time lag was best explained by the sequence of labor inputs required for the two resources. Acorns are a *back-loaded*, as the initial collection and storage is relatively cheap and easy, and only gets expensive later on when they need to be processed for consumption (i.e., ground, leached, and cooked, or coated with clay and baked). So when people began to experiment with higher levels of sedentism and storage, creating multiple, low-cost caches of acorns entailed minimal risk, because if they needed to be abandoned the loss would be minimal. Salmon, in contrast, is a *front-loaded* resource—they are more difficult to acquire than acorns and, more importantly, if they are to be stored for later use, they must be smoked, dried, and stowed right way. Once this expensive upfront work is completed, there is little effort required during the later consumption side of the process. But because of this upfront expense, salmon caches were much more valuable than acorn caches, and tended to tie people down in a much more significant way once this commitment was made.

Moving to the upper Sacramento Valley, Basgall and Hildebrandt (1989) originally proposed that the acorn-salmon, semi-sedentary economic system developed around 4000–3000 cal BP. But similar to Tushingham's findings, subsequent work by Hildebrandt et al. (2005) showed that the major riverine focus (with fish bone and fishing gear; see also Hildebrandt and Darcangelo 2008) did not develop until after 1500 cal BP. Also similar to Tushingham's findings, plant macrofossil remains from the Sacramento River Canyon (Wohlgemuth 1989) and farther south along the Sacramento River (Dreyer 1984; Hildebrandt and Kaijankoski 2011), all indicate that acorns were an important resource by at least 4300 cal BP.

The discontinuity between acorns and salmon seems to have occurred farther south along the Colusa Reach of the Sacramento River as well. During the phase dating between 4385 and 3460 cal BP, when acorn was important, White (2003:179) found that, "Cyprinids, perch, and sturgeon were probably harvested during spring and summer spawning runs. Intensive waterfowl and acorn harvest dominated the fall. Little use was made of salmonid fisheries." Even between 3222 and 2750 cal BP, "Fish harvest was unchanged from the previous phase [with] little attention to salmonids" (White 2003:179). Finally, by his 1180–970 cal BP phase, White (2003:180) found that, "For the first time, salmonids were a significant

part of the local diet." These finding are consistent with those of Broughton (1988, 1994), and could reflect a rather late introduction of weirs to the Sacramento Valley economic system (White 2003).

A possible exception to this emerging pattern comes from the Lake Britton area, where there was a fundamental reorganization of settlement at about 3,000 years ago. Here, seasonality studies on mussel shells show that major winter villages were established close to the Pit River, and were accompanied by dense shell middens, elaborate fishing gear (e.g., toggle harpoon fragments), and greater quantities of fish remains, especially after 2000 cal BP (Cleland et al. 1995). Unfortunately, it is difficult to determine how much salmon contributed to this increase based on the data presented.

Data Requirements

This exciting research issue can be addressed on a variety of levels by future researchers. Following the lead of the studies outlined above, it will be important to (1) monitor settlement pattern changes vis-à-vis key riverine habitat types; (2) assess the composition of artifact assemblages and features, paying special attention to tools associated with fishing and acorn processing, and features linked to long term habitation and storage; and (3) carefully study subsistence remains, making sure that proper fine-grained sampling procedures and analytical methods are used, similar to those used by White (2003) and Hildebrandt and Darcangelo (2008). It may also be useful to consider how construction of weirs and intensive salmon storage relate to higher levels of sedentism, and once they are in place, how the increased sense of permanent space relates to the establishment of formal cemetery areas (Ritter 1968).

Finally, because salmon are keystone predators within a marine ecosystem composed of multiple trophic levels (many more than in terrestrial systems), and because carbon and nitrogen isotopes enrich when moving up through the food chain, humans relying on salmon will have a completely different isotopic signature than those who do not. These differences can be preserved in the osteological remains of these individuals, providing additional evidence for when this important economic transition occurred (Bartelink 2009; Greenwald and Burns 2016). There are obvious issues of cultural sensitivity regarding the analysis of human bone for these purposes, but it is our experience that Native American tribal representatives can be open to isotopic studies in certain select situations. The importance of archaeological human bone from well-controlled contexts for these kinds of studies should not be overlooked.

EVOLUTION OF MILLING TOOLS AND FEATURES

The prehistoric archaeological sequences outlined above (see the *Prehistoric Context* section, page 29) show a great deal of variability across both space and time in the kind of milling tools and features that were used. All areas show no milling gear during the late Pleistocene and earliest Holocene, followed by a dominant presence of handstones and millingslabs beginning about 8,000 years ago. Bowl mortars and pestles come on the scene quite early in the Upper Klamath zone, where they are present in the Basin Period (7800–5200 cal BP; Mack et al. 1991), especially in areas to the east well beyond the distribution of oak trees (O'Connell 1971). They were not regularly used until significantly later elsewhere, with sporadic evidence showing up in Sierra Nevada foothills and adjacent lowlands as part of the Mesilla Complex (4500–2500 cal BP), in the upper Sacramento Valley as part of the Whiskeytown Pattern (4500/3200–1600 cal BP), and in the southern part of the North Coast Ranges as part of the Mendocino Pattern (4500–1500 cal BP).

Bowl mortars and pestles were never used at all in the Southern Cascade Foothills, nor in the northern reaches of the North Coast and Klamath Mountains/North Coast Ranges. Instead, hopper (basket) mortars and distinctive pestles were used, and introduced throughout the study area after about 1500 cal BP, except in the Cascade Foothills where they are thought to be part of the Kingsley Complex

(2580–1400 cal BP). They co-occur with bowl mortars and pestles south of Yana territory within both foothill and valley habitats, but largely replace bowl mortars and pestles elsewhere.

Bedrock mortars are only abundant in the Sierra Nevada south of Yana territory, and appeared during Sweetwater Complex times (1100–500 cal BP). It is also important to emphasize that the old handstone and millingslab technology was completely replaced within areas where large semi-sedentary populations took over (e.g., the Sacramento Valley and North Coast), but persisted in hinterland areas, especially in Yana territory and perhaps parts of the Klamath Mountains/North Coast Ranges where populations were smaller and used more mobile settlement systems.

Most researchers have long assumed that handstones and millingslabs were primarily used for small seeds, and mortars and pestles for acorns. This view was not based on archaeological findings, but on ethnographic analogy—ethnographers observed California groups processing acorns with mortars and pestles, and Great Basin peoples processing small seeds with handstones and millingslabs (the latter observation not being in California because the technology was so rare in the state during ethnohistoric times). But we are beginning to learn from the archaeological record that this assumption has not always been correct, especially deep in the prehistoric past.

As noted above, the first exception occurs in northeastern California, where bowl mortars and pestles were used between 7800 and 5200 cal BP over 100 kilometers from the nearest major stands of oak. Second, plant macrofossil data from early Holocene components at Clear Lake, Los Vaqueros (Contra Costa County), and the Sky Rocket site (Calaveras County) show that acorns were a primary resource at this early time, but associated with handstones and millingslabs, and not mortars and pestles (Hildebrandt 2007; Rosenthal et al. 2007). Third, although small seeds were used throughout prehistory, plant macrofossil data show that there was a major increase in their use late in time (Wohlgemuth 2004, 2010), including within the current study area (see *Prehistoric Context*, page 29), long after mortars and pestles became the dominant form of milling gear.

Based on these findings, it has been hypothesized that the different types of milling gear may have been more highly linked to settlement organization than to the type of resource being processed (Hildebrandt 2007; Rosenthal et al. 2007). People operating within a mobile system of settlement that could not carry their milling gear (e.g., Martis/Bucks Lake Complex, Borax Lake and Mendocino Patterns) would have used the more expedient handstone-millingslab technology, as it could be produced on demand with little investment. Mortars and pestles, in contrast, are more costly to produce, but more efficient at processing food resources, and work well among more sedentary peoples who could rely on the regular use of their tools. It should be emphasized, however, that increased sedentism was often linked to acorn storage, so the intensive use of acorns and mortar-pestle technology obviously went hand-in-hand in many places during the late Holocene (Basgall 1987).

If this proposal is correct, it would help explain why: (1) mortars and pestles were not accepted and used simultaneously throughout northern California, (2) mortars and pestles are not typically found in early Holocene contexts even though acorn plant macrofossils are, and (3) mobile peoples like the Yana continued to use handstones and millingslabs into the Late Period, even though they relied on acorns as a subsistence resource.

Explaining the origin and distribution of bedrock mortars is also an important research issue that may be related to social organization. According to Bettinger (2015), their emergence at about 1,000 years ago co-occurs with a transition from a centralized, group-level system of food sharing, to one focused more on the private, family-level of ownership. The explosion of bedrock mortars at this time, and their distribution (small clusters in multiple locations), could reflect family ownership of both the milling features and the adjacent oak groves. Their concentration in the Sierra Nevada could partially be due to the

presence of high-quality granitic bedrock (not present elsewhere), as well as higher population densities and levels of territoriality, at least when compared to the Yana where they are only sporadically present.

Understanding the origin and distribution of hopper mortars and pestles is even less secure than the other forms of milling technology discussed above. Based on findings within the upper Sacramento Valley, the technology appears to have arrived with the Wintu (and the Shasta Pattern), and may have spread out from there. Even if this were the case, it has yet to be determined why it replaced bowl mortars and pestles in so many places, and why it did not in others, especially when moving into the southernmost margins of the study area.

Finally, tracing the origin and distribution of wooden mortars and pestles is also an important research issue, especially in parts of the Sacramento Valley where lithic resources were limited. In fact, some of the earliest evidence for mortar-pestle technology is evident in the lower Sacramento Valley and Delta, where wooden pestles (with their distinctive polish) have been found in components dating to 5800 cal BP (Rosenthal et al. 2007). Although the earliest well documented presence in northern California dates to Bidwell Complex (2500-1100 cal BP) times, it seems likely that older examples will eventually be found in residential sites along the Sacramento River.

Data Requirements

This is a major, multi-dimensional research issue that will take several years to solve. First, it will be important to refine our knowledge of the time-space distribution of the various types of milling technologies (including their environmental settings), and document the settlement systems they were operating within (e.g., where are they along the mobile-sedentary continuum?). Second, a continued focus on the collection and analysis of plant macrofossils will help in this endeavor. And finally, future researchers should explore the collection and analysis of starch grains, as this appears to be a promising avenue of research that has the potential to clarify the full range of resources with which these tools and features were used.

INTER-REGIONAL EXCHANGE

Obsidian and shell beads are the primary archaeological indicators of exchange in California, as both commodities are relatively common in most parts of the state (Hughes 2011; Hughes and Milliken 2007). This is clearly the case in the current study area where obsidian from the Medicine Lake Highlands, Tuscan, Borax Lake, and Napa (Figure 13) is widely distributed across a wide range of places and times. Shell beads are less common, but also provide important insights about past interaction spheres and, ultimately, the rise of monetary systems late in time (Bettinger 2015). The following discussion highlights some previous studies of exchange, and provides guidance on how researchers could improve on this work in the future.

We begin with obsidian, distinguishing between utilitarian and non-utilitarian uses, as they (and the exchange systems associated with them) followed differing pathways over time. We then turn to shell beads, which also appear to be associated with exchange systems that were disjunct from those linked to the utilitarian use of obsidian.

Utilitarian Obsidian

All of the prehistoric sequences reviewed by this study reveal major adaptive changes over time linked to a series of important economic developments, especially those associated with increased sedentism, population growth, territorial circumscription, and inter-regional exchange. Several researchers in the past have hypothesized that inter-group exchange should have reached maximal proportions late in

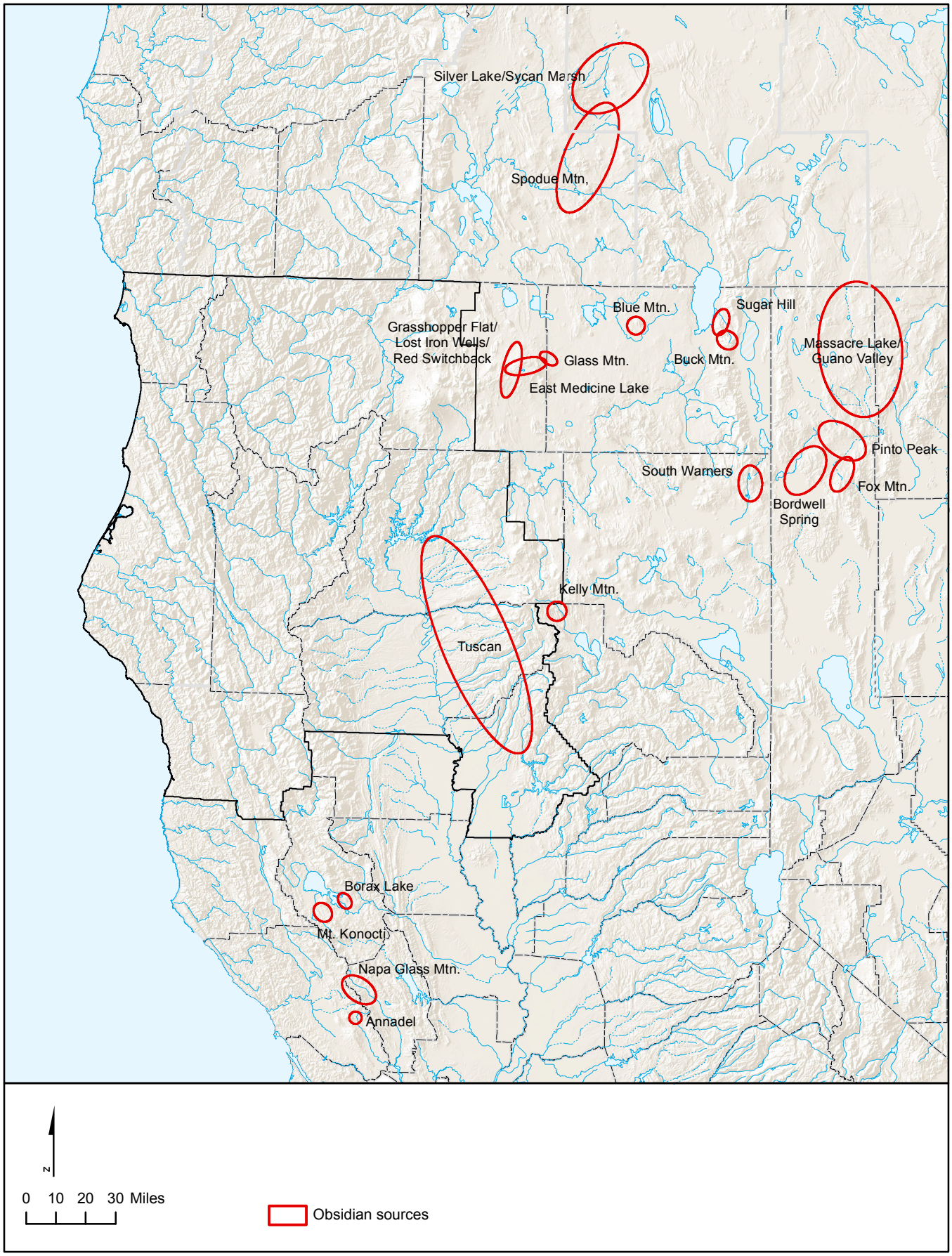

Figure 13. Regional Obsidian Sources.

time (after 1000 cal BP) largely due to increased population density and less residential and logistical mobility. As local populations became increasingly restricted to smaller and smaller territories (see the tribelets described in the *Ethnographic Context* section, page 91), it was thought that non-local resources located significant distances from those territories were primarily obtained through trade rather than direct access by logistically organized forays, which was more likely earlier in time when population density and territoriality were significantly lower. Given the need to obtain both food and non-food resources from non-local areas, the movement of exotic obsidian was thought to be an important archaeological indictor of exchange, both for the obsidian itself and as a proxy for other commodities that do not preserve in the archaeological record.

Although this hypothesis makes good sense, and finds some support in the ethnographic record, it has not been borne out by archaeological findings throughout most of California (Gilreath and Hildebrandt 2011; King et al. 2011), including those from the current study area. A study of Medicine Lake Highlands obsidian profiles by Gilreath et al. (1995; see also Hildebrandt and Mikkelsen 1994), for example, found that the production and exchange of this material, with a few exceptions, peaked between about 3000 and 1000 cal BP, followed by a steep decline in this activity thereafter. This peak and decline was also found by Hildebrandt et al. (2005) in the northern Sacramento Valley, where they also observed that the post-1000 cal BP decline in Medicine Lake Highlands obsidian was replaced by the more local, but lower quality material from the Tuscan obsidian sources (see also Hamusek-McGann 1993; Jensen 1994; Sundahl 1982; Vaughan 1992; Vaughan and Sundahl 2002), as well as by local cryptocrystalline silicate stone (CCS) and metavolcanic stone at archaeological sites in the western foothills (Bevill and Nilsson 1996; Darcangelo et al. 2015).

Moving south, a similar peak in production has been observed within the Borax Lake obsidian zone, but it appears to have started earlier, ranging between about 5000 and 1500 cal BP (White et al. 2002). Excavations at Hamilton City along the Sacramento River, at the southern end of the current study area, show a peak use in both Borax Lake and Medicine Lake Highlands obsidian between about 3000 and 1000 cal BP, and the same decline and replacement with Tuscan obsidian thereafter (Hildebrandt and Kaijankoski 2011). Delacorte and Basgall's (2006) work near Lake Oroville shows a significant presence of Borax Lake and Napa obsidian between about 5500 and 2300, the familiar peak in Medicine Lake Highlands obsidian between 2300 and 1200 cal BP, and the collapse thereafter, being replaced by more localized basalts, various CCS material, and Sierran obsidians.

The reasons for the decline of obsidian production and exchange at the big obsidian quarry complexes are poorly understood. Most researchers working elsewhere in the state think it resulted from two main factors: social and economic disintegration stemming from the MCA (Jones et al. 1999; Moratto 2011), and the reduced need for toolstone with the introduction of the bow and arrow (Gilreath and Hildebrandt 1997, 2011; Hildebrandt and McGuire 2002; Delacorte 2004). With regard to the MCA, Moratto (2011) argues that drought conditions significantly lowered the availability of useful plants and animals, reducing overall carrying capacity. This economic stress increased competition for declining resources, creating greater intergroup enmity and eroding social contexts that previously favored exchange. Simultaneous to the MCA, bow-and-arrow technology took hold throughout California and, in many cases, was accompanied by a change from biface-reduction technology (which requires a great deal of toolstone), to a simpler core-flake technology, where many tool types (including arrow points) were much smaller than before and could be made from flake blanks. Not only were lesser quantities of material required, making local toolstone more viable, a significant amount of material could be scavenged from older archaeological sites, effectively expanding the distribution of quarries.

Data Requirements

Despite the strong patterning outlined above, our knowledge of the dynamic nature of prehistoric obsidian exchange is far from complete, and the reasons why it changed over time and space are even less well understood. As a result, future researchers should continue to conduct obsidian source and hydration studies whenever possible, expanding on the existing database and improving the production profiles at the quarries and, more importantly, widening the geographic and temporal distribution of consumption activity in the study area. Obsidian hydration data alone, however, is not good enough to address this issue, because the ratio of obsidian to local non-obsidian toolstone is crucial; this means it is necessary to identify single-component assemblages (i.e., to determine what these ratios are for each time period within each localized study area).

Determining the effects of the MCA on local adaptations is a more difficult task, requiring the analysis of large-scale settlement pattern data, and it is beyond the scope of this discussion. But testing the hypothesized shift in flaked stone technology associated with the introduction of the bow and arrow is much more approachable, as documenting a shift from biface-reduction to core-flake strategies is a relatively straightforward task for those trained in flaked stone analysis. The combination of source-specific obsidian hydration profiles, ratios of non-local obsidian to local toolstones from single-component areas, and technological analyses of single-component flaked stone assemblages, when compared to the larger regional database, will make great strides toward expanding our knowledge of inter-regional exchange deep into the prehistoric past.

Non-Utilitarian Obsidian

The current study area is unique when it comes to this topic because there are two documented exchange systems focused on non-utilitarian obsidian artifacts that are not known elsewhere in California. They include ceremonial blades imported to northwest California (mostly into Wiyot, Yurok, Hupa, Karok, and Tolowa territory), and the practice of placing burials on beds of obsidian debitage, found mostly in Mattole/Bear River, Sinkyone, Wintu, and Nomlaki territory. Unlike the exchange of obsidian for utilitarian purposes, both of these systems seem to have occurred quite late in time, probably post-dating 500 cal BP.

Large ceremonial obsidian blades or bifaces, which range between 25 and 50 centimeters long, were used as part of the White Deerskin Dance (Kroeber 1925). They also represented important markers of wealth and social rank, which is clearly evidenced by their distribution across burial populations in the region (Hildebrandt and Levulett 2002). Hughes' (1978) analysis of the geochemical source of the blades and other, everyday utilitarian artifacts like projectile points, found that the latter items were from the closest Medicine Lake Highlands quarries, while the blades were almost always from more distant sources, including ones that included red obsidian (e.g., Warner Mountains, Vya, and Glass Buttes). He concluded that the exotic nature and more distant origin of the blades probably gave them added value beyond their large size and exquisite manufacture.

Burying people on beds of obsidian debitage is documented farther south along the coast, especially within the King Range. The obsidian in these cases originated from the Medicine Lake Highlands and, in one example, included a bed of about 4,500 pieces of debitage produced by rapid hard hammer percussion. Based on obsidian hydration readings and associated temporally diagnostic artifacts (including clam disk beads), this burial practice appears to date within the last 300 years. Although the practice is not widely known, Levulett and Hildebrandt (1987) note that it has been found in Tehama County along Blue Tent Creek (Treganza 1954).

Data Requirements

Although both of these examples are concentrated on the coast, ceremonial blades and obsidian-bed burials are also sometimes found in the interior as well. It follows, therefore, that future researchers should map their respective time-space distributions, with the goal of discovering their origin and possible ethnic connections, especially given that the blades seem to be associated with the core northwest California groups, and that the obsidian beds seem more linked to the southern Athapaskan area. It also goes without saying that obsidian source analyses should be conducted whenever possible.

Shell Beads and Other Ornaments

Shell beads were exchanged in California and the Great Basin for a long time. Small numbers of *Olivella* (recently renamed *Callianax*) spire-lopped beads were moved from the coast to the interior southern California deserts about 10,000 years ago (Fitzgerald et al. 2005), while the Middle Holocene (roughly 5500–4500 cal BP) saw the movement of a limited number of grooved rectangle beads moving from southern California up the coast to the San Francisco Bay Area, as well as into the northwestern Great Basin, not that far from the northeastern margins of the current study area (Vellanoweth at al. 2014). Soon thereafter (about 5000 cal BP), the production and exchange of shell beads increased, with rectangular *Olivella* beads regularly placed in burials throughout the greater San Francisco Bay area, lower Sacramento Valley, and the Sacramento-San Joaquin Delta, but south of the current study area. The average number of beads per burial (represented by a variety of *Olivella* wall beads) remained the same until about 1,000 years ago when the frequency quadrupled and remained relatively high thereafter (Rosenthal 2011).

Although Rosenthal's (2011) study does not extend into the current study area (it essentially ends in Colusa and Sutter counties), a comparison of his data with archaeological assemblages from these more northerly areas (including the study area) shows that they lie outside of the major *Olivella* bead trade network. South of our study area it is not uncommon to have tens of thousands of *Olivella* beads at a single site, and thousands of specimens with a single individual (Rosenthal 2011). Archaeological excavations within or near the study area in the Sacramento Valley also include *Olivella* beads, but only a handful compared to areas to the south (e.g., Hildebrandt and Kaijankoski 2011; White 2003). This is also the case when moving up into the adjacent foothills where Ritter (1968:148) states that "The number of beads per site seems to increase with a decreased distance to the valley" (see also Delacorte and Basgall 2006).

Everything changes with the introduction of clam shell disk beads at about 450 cal BP. They become quite common in a variety of locations in the study area, dominating assemblages in the foothills (e.g., Delacorte and Basgall 2006; Ritter 1968), up the valley into the Redding area (e.g., Hildebrandt and Darcangelo 2008; Meighan 1955; Sundahl 1982), out to the north coast (Levulett and Hildebrandt 1987), and in the North Coast Ranges (Fredrickson 1984; Meighan 1955). The significance of these beads is noted in the ethnographic record, including their value as a medium of exchange which, consistent with the original hypotheses outlined at the beginning of this discussion, appear to have been used as a way to redistribute food in many parts of the state (Rosenthal 2011).

Finally, it is important to note that several other bead and ornament types became important late in time throughout much of northern California. These include abalone ornaments, *Dentalium*, *Glycymeris* and limpet shell beads, pine nut beads, *Vibunum* seed beads, and steatite and magnesite beads. Their distribution in the archaeological record is best summarized by the following references (Dotta and Hullinger 1964; Farris 1982; Elsasser and Heizer 1964; King 1978; Loud 1918; Levulett and Hildebrandt 1987; Milburn et al. 1979; Ritter 1968; Smith and Weyouth 1952; Sundahl 1982; Treganza 1954, 1963; Treganza and Heicksen 1960; Woolfenden 1970).

Data Requirements

There are many useful avenues of research to increase our knowledge and understanding of prehistoric bead exchange within the study area. First, it is important to classify them correctly, as subtle differences in their morphology can have significant implications for their age and place of origin. Classification of the beads should rely on Bennyhoff and Hughes (1987), supplemented by Milliken and Schwitalla (2009), and their ages derived from Groza et al. (2011). It is also important to obtain direct radiocarbon dates on a sample of beads whenever possible, to further our knowledge of their age in geographic locations for which we lack such information, especially in outlying places where there may have been a time lag in their arrival. And, finally, it is important to quantify their presence, and compare these data to other regional assemblages, to better understand their changing role in local economic systems over time.

ROCK ART

Three basic kinds of rock art exist in or near the study area: petroglyphs (art pecked, incised or abraded into the stone); pictographs (art painted on the rock); and portable art (small pieces of stone that are typically incised or painted). Pitted petroglyphs are relatively common in northern California, widely distributed in the northern Sierra Nevada, southern Cascades and the North Coast Ranges. They are variously known as *cupule rocks* or, when associated with lines or grooves carved into the rock, *pit-and-groove* petroglyphs. Three sub-groupings (also called styles) have been defined by Payen (1962): (1) pitted boulders (simply cupules); (2) pit-and-groove (two pits connected by a groove or a pit terminated by a groove, or unconnected pits and grooves); and (3) complex pit-and-groove (extensive compositions [sometimes hundreds of cupules] and elaborate grooves). The latter sometimes has elliptical to rounded grooves bifurcated with a line, perhaps representing vulvas (see also Gilreath 2007).

According to Gary and McLear-Gary (1988), nearly half of the of the more than 50 petroglyph sites recorded in Mendocino County include only cupules. They are usually located near water, and most researchers think they are associated with weather control and fishing (Kroeber and Gifford 1949; Heizer 1953; Kroeber and Barrett 1960; Nissen and Ritter 1986). This form of art is thought to have originated deep in antiquity, perhaps starting around 7800 cal BP (Baumhoff 1980; Heizer and Baumhoff 1962). It seems to have persisted into ethnographic times in a limited number of places, especially among Hokan speaking groups and their neighbors (e.g., Pomo [known as baby rocks] and Karok [known as rain rocks]) as part of their world-renewal ceremonies (Nissen and Ritter 1986). They are also thought to be footprints of the first people by contemporary Achomawi tribal members, and places of great power that were used to initiate spirit quests into the mountains (Benson and Buckskin 1992).

Based on these rough patterns, Baumhoff (1980) hypothesized that an ancient Hokan cultural substrate once covered much of northern California, and that the pitted petroglyphs may have been part of this cultural pattern. It was further hypothesized that the rock art tradition was largely replaced in the territories of newly arriving ethnolinguistic groups (e.g., peoples speaking Penutian languages), perhaps resulting in their continued production among Hokan speakers and an absence among other, more recent peoples. It was also expected that this would not be a one-to-one relationship, due to the probable borrowing of traits among certain groups.

More recent work in the North Coast Ranges by Gary and McLear-Gary (1988) and Foster and Foster (2002) indicates that pit-and-groove may not be the oldest form art in the region. Based on the superposition and differential patination of a variety of key motifs, it appears that, in addition to pit-and-groove, some of the oldest elements include large ovals (also known as Pecked Curvilinear Nucleates), concentric circles, and grooved lines. These are followed by abstract curvilinear elements, and then by fine-scratched lines, and ultimately deep incised lines.

Pit-and-groove rock art also occurs across the Sacramento Valley in the Sierra Nevada Zone, with concentrations in the Butte County foothill areas (Heizer and Clewlow 1973; Payen 1962). The area also includes a presumably later series of abstract curvilinear elements, also known as Valley-Sierra Abstract. Finally, incised lines are also found in this area and, as in the North Coast Ranges, probably tend to post-date the other forms (Payen 1962). A fine-grained analysis of these elements by Ritter and Parkman (1992) indicates that some (especially the circular motifs) could mark the arrival of the Konkow to the area.

Another important rock art class well known in the northern Sierra Nevada is High Sierra Abstract-Representational (also known as Style 7; Payen 1962). Although its northern distribution appears to fall just south and east of the current study area, its distinctive character is worth noting because it looks to be an ancient cultural indicator. Perhaps its most distinguishing attribute is the relatively high frequency of rough anthropomorphs and animal tracks, especially bear paws. Despite being linked to the Great Basin by some researchers (Elsasser 1960; Kowta 1988; Whitley 2000), its unique character and restricted distribution in the northern Sierra, as well as its strong geographical overlap with Martis Complex sites, appear instead to be a unique, ancient California phenomenon (Foster et al. 2005; Gortner 1984; Payen 1966).

Several important rock art sites also exist up the valley not far from Redding. Van Tilburg et al. (1987) and Millett and Ritter (2013) document a concentration of panels known as the Church Rock site (SHA-39), composed of many cupules, grooved elements, and a more limited number of representational motifs including animal prints. The presence of representational figures has also been found at other nearby sites, including SHA-217, where humans, artiodactls, and birds are found, as well as foot prints of birds and bears (Heizer and Clewlow 1973). Although the age of these elements is difficult to determine, it is certainly a distinctive, and a highly localized cultural pattern.

A completely different kind of rock art was produced farther north, just east of our Upper Klamath Zone within Klamath-Modoc territory; it includes both petroglyphs and pictographs (Ritter 1998; Whitley 2000). Whitley associates some of it with the Columbia Plateau and states that the:

> Plateau Tradition rock art is characterized by simple stick-figure humans, block-bodied animals, rayed circles or arcs, concentric circles, and 'tally' marks (or sets of short parallel lines), along with a variety of other, but less common geometric designs. The art includes engravings, usually pecked, and paintings, which tend to be thick lined and crudely rendered (Whitley 2000:68).

Much of this art is concentrated within Lava Beds National Monument, adjacent to Tule Lake, and at Petroglyph Point, where there are several petroglyph panels located high on the cliff faces associated with wave-cut notches that would have been accessible (by boat) only deep in the past. The pictographs, in contrast, are found in more accessible areas, indicating that they are significantly younger in age (Gilreath 2007; Lee et al. 1988).

Three additional, and somewhat unusual, rock art forms are worthy of comment. The first, highly isolated finding, is a series of engraved stones incorporated among the pavers along the margins of a Hupa redwood slab house. They included various concentric arches, pits, and small grooves. One had 13 groves that may have been re-grooved according to lunar periods and, hence, they are known as Hupa Calendar Stones (Goldschmidt 1940).

The second is an isolated petroglyph fragment found in the Yolla Bolly Mountains. It is unusual because it was made on non-local stone and had abstract curvilinear and rectilinear elements pecked into the stone, reminiscent of Great Basin styles and quite different from the local incising and grooving techniques (Meacham 1984).

The third includes a limited number of pictographs found near Shingletown, including a polychrome painting of a face. This unusual element is not found in California but is common in the Pacific Northwest, perhaps reflecting visits by Native peoples traveling south with the large Hudson's Bay Co. trapping expeditions, or by individuals associated with the Ghost Dance, which brought people together from many faraway places (Ritter 1986).

Finally, a major concentration of portable rock art is located within the current study area, centered in the Sacramento River Canyon and adjacent lands. It is composed of small tablets that have been incised, often producing parallel bands in-filled with a series of straight lines and Xs, or more complex cross-hatching using triangular or diamond shapes. It appears to be one of the largest (1,500 have been found) and well-dated (5700–3200 cal BP) assemblages in North America and is thought to be associated with a contested boundary area; wearers/owners of the tablets would be afforded "stylistic reinforcement of group affiliation" and differentiation from their neighbors (McGuire 1989:D43).

Data Requirements

The most obvious data requirement for the study of rock art is to continue finding it, and carefully record it. Once the panels have been found, each element should be classified using the most up-to-date methods developed in the local area. These data should be quantified and presented in a tabular fashion (i.e., provide counts of each element or motif type per site). Non-quantitative, presence-absence data are not sufficient to differentiate rock art complexes from each other and adjoining areas, nor are they sufficient for isolating change over time.

Observations concerning superpositioning and differential weathering should also be made, as these data may help isolate any chronological change in the mix of elements produced, and help place the overall complex in time. Chronological ordering can also be accomplished by analyzing the age of the associated archaeological record. With regard to the latter, Foster et al. (2005) and Gortner (1984) have made good headway on this topic within the northern Sierra by cross-tabulating projectile point types against rock art elements. Gilreath and Hildebrandt's (2008) study of the relationship between land-use chronology and changing rock art styles in the Coso region might also provide a good model for future researchers in the current study area.

HISTORICAL LINGUISTICS AND POPULATION REPLACEMENTS

Due to the high level of linguistic diversity within the study area, and significant differences in the ages of the languages that were spoken, it is clear that new ethnolinguistic populations entered the region on multiple occasions. This situation has led historical linguists to work with archaeologists in the attempt to identify these hypothetical population movements in the archaeological record. While this is an interesting and worthy task, it is not an easy one because there is no guarantee that ethnicity, language, and material culture will co-vary with one another (Hughes 1992). Despite these issues, multiple models have been proposed to elucidate the linguistic prehistory of northern California. For the purpose of this study, we highlight three of them: the arrival and expansion of the Wintu, the arrival of Algic and Athapaskan populations in northwest California, and the arrival of Maiduan speakers in the northern Sierra.

Arrival of the Wintu

The Wintuan family includes Wintu, Nomlaki, and Patwin. Analysis of historical linguistic data by Whistler (1977) indicates that proto-Wintun split apart between about 3,000 and 2,500 years ago in Oregon, while Wintu/Nomlaki became a discrete branch about 500 years later. The Patwin probably migrated down the Sacramento Valley first, and ultimately pushed up against Miwok territory in the Suisun/Carquinez area

by about 1500 cal BP. The Wintu/Nomlaki moved south out of Oregon next, settled the northern valley, divided into two distinct languages, and then spread up the various tributaries of the Sacramento and upper Trinity rivers. Whistler identified Oregon as the homeland of these languages, as he was able to identify several proto-Wintun words for plants and animals that live in Oregon, and also found that they borrowed new words from an existing population in California (the Miwok) for species in the Sacramento Valley area that were absent in Oregon (see also Golla 2011).

The estimated arrival of the Wintu fits fairly well with the emergence of the Shasta Pattern at 1500 cal BP, which represents a radical change in the archaeological record that one would expect with the arrival of a new people. An Oregon homeland is also consistent with the introduction of advanced salmon fishing technologies and large-scale riverine villages, as both of these phenomena were in existence at an earlier date in the northwest than in California (Moratto 1984). The displacement or assimilation of Chimariko speakers in the Trinity drainage, and Shasta speakers on the upper McCloud, indicates that the Wintu expansion was ongoing at the time of contact as well (Golla 2011). Expansion into Yana territory has also been documented within the archaeological record by Sundahl and Clewett (1991).

Arrival of Algic and Athapaskan Populations in Northwest California

The limited time depth of the coastal archaeological record in northwest California (see the *Prehistoric Context* section, page 29), and the high degree of linguistic diversity that characterizes the area, has also sparked interest of historical linguists, including Whistler (1979). The earliest people in the area were thought to be ancestral Karok (of the Hokan stock), who had an interior subsistence focus. About 1,000 years ago, the Wiyot and soon thereafter the Yurok (both speakers of Algic languages) entered the area. It appears that they originated from the Columbia Plateau, judging from similar cultural traits found in both areas (see also Fredrickson 1984; Moratto 1984: 565). The Wiyot occupied the previously underused coast and estuary habitats of Humboldt Bay, while the Yurok occupied the lower Klamath and adjacent coastal lands. These intrusions were made possible by their superior technological abilities to fish, build boats, and store salmon. Finally, Athapskan peoples are thought to have entered the region about 700 cal BP. Except for the Hupa, these groups occupied mainly peripheral areas, bringing with them knowledge of forest and riverine environments, as well as the toggle harpoon and sinew-backed bow (Fredrickson 1984).

This model has been challenged by Gmoser (1993) who argued that the riverine-coastal interface had one of the highest resource potentials in the region and therefore should have been occupied for a long time (see also Codding and Jones 2013). He further suggested that the Wiyot and Yurok might be linguistic isolates, and may have actually lived in the area much longer than originally thought. This position, however, has not been adopted by more recent linguistic studies (e.g., Golla 2011).

Although Tushingham (2009, 2013) has shown that people began to increase their settlement of riverine areas at about 3100 cal BP, she found that the intensive use of salmon (including storage) and coastal resources (including oceangoing canoes) did not happen until sometime after 1500 cal BP, and that these changes were so abrupt and significant that they probably reflected population intrusions similar to these hypothesized by Whistler (1979). Moreover, the higher settlement priority given to interior riverine habitats by Whistler's (1979) model is largely matched by the distribution of Yurok settlements at historic contact, where there were more villages along interior riverine settings than along the coast (Pilling 1978), and higher population densities estimated for the interior as well (Baumhoff's 1963). Finally, it is interesting to note that Kroeber (1939:28) also concluded, based on the spatial distribution of cultural traits, that the people of northwest California were "originally a river or river-mouth culture, later a beach culture, and only finally and in part a seagoing one."

Finally, the Late Period arrival of people from northern latitudes may also be reflected by changes in the use of certain key obsidian sources over time. Whitaker et al. (2008) found that prior to 1500 cal BP

most obsidian in southern Humboldt and northern Mendocino counties originated from the south, largely from the Borax Lake source. After 1500 cal BP, presumably after the arrival of the Athapaskan speakers from the north, almost all obsidian also came from the north, mostly from the Medicine Lake Highlands. They concluded from these findings that the shift in conveyance patterns was probably due to stronger social ties among the new arrivals to their linguistic relatives to the north.

Arrival of Maiduan Speakers in the Northern Sierra Nevada

Most researchers agree that ancestral Maiduan-speakers originated in the northwestern Great Basin (Golla 2011; Moratto 1984; Whistler 1978). The minimal linguistic divergence among Maiduan languages probably reflects a single, relatively late entry into California. Kowta (1988) thinks they arrived about 1500 cal BP and settled to the south along the foothills or valley edge in what is now Nisenan territory. Later, they expanded north into the Oroville area, assimilating Hokan-speakers who are reflected archaeologically by the Mesilla (4500–2500 cal BP) and Bidwell (2500–1100 cal BP) complexes. These Proto-Nisenan also grew in number and began to enlarge into what is now Konkow territory in Butte County, introducing various traits ultimately derived from neighboring groups from the south and forming the Sweetwater Complex (1100–500 cal BP), and representing the earliest Maiduans in Konkow territory. Finally, but still during Sweetwater times, the Proto-Konkow population expanded into Plumas County to establish Maidu-speakers there, as well as into the Sacramento Valley where numerous settlements of the Chico Maidu (Mechoopda) were established.

Golla (2011:251) has a different view of where the first peoples settled, stating "That three of the four historic Maiduan languages were located in the northern third of Maiduan territory indicates a southward spread, probably from a Proto-Maiduan homeland in the Feather River drainage." He agrees with the timing and probable association with the Sweetwater Complex, stating that "this spread could not have begun before 800–1000 AD," and with the late expansion out into the valley which probably occurred only during the last few centuries.

Finally, Golla (2011:252) notes that a phonological profile shared by the Maidu and Washo, probably "diffused from Washo into Maiduan, most likely through Washo being substratal in all or part of Proto-Maiduan"—meaning that the Washo probably occupied large swaths of the western Sierra deep in the past.

Data Requirements

Archaeological data sets required to address hypothetical models of population replacements like those outlined above are similar to those required to deal with most other complex issues. It will be necessary to investigate sites with one or more temporally discrete depositional components that can be tied to a specific population or ethnic group on the basis of artifact types or other evidence. Generally, the best artifacts for this kind of analysis are those imbued with distinctive stylistic characteristics, such as projectile points, harpoon types, or other distinctive tools or ornamental gear. In addition, methods of house construction and interment, as well as styles of rock art have been used with varying success to address this issue within the study study area.

Finally, the whole argument surrounding the identification of ethnic groups in archaeological assemblages has been revolutionized by advances in DNA fingerprinting, and there have been attempts to characterize both modern and prehistoric Californian and Great Basin human populations (Eshleman and Smith 2007). There are obvious issues of cultural sensitivity regarding the analysis of human bone for these purposes, but it is our experience that Native American tribal representatives can be open to genetic studies in certain situations.

PYRODIVERSITY AS A LAND-USE MANAGEMENT STRATEGY

The effects of human activity on past ecosystems is a topic that has recently come to the forefront of cultural resources studies. A recent book by Lightfoot and Parish (2009) reviews how Native burning, also known as the pyrodiversity approach to land management, served to maintain a complex mosaic of vegetation communities, enhancing the productivity of economic plants such as small seeds and acorns (see also Anderson 2005), as well as benefiting local deer populations (see also Taber and Dasmann 1958). One of the most important outcomes of this strategy was to prevent the encroachment of dense climax conifer forests on more-productive habitat types. This encroachment is, in fact, currently obscuring historically recorded ecotones in the current study area where many archaeological sites tend to be located (Keter 1995). Lightfoot et al. (2013) are currently making headway on this issue by forming collaborative programs composed of archaeologists, Native Americans, and biologists, to better understand the distribution of archaeological sites through controlled burning, archaeological survey and excavation, and traditional knowledge.

Another aspect of the pyrodiversity approach is the dramatic change in fire-management philosophy and practice with the arrival of Euro-Americans in the region, and how that change continues to influence fire regimes and land management practices to the present-day. This unconformity in land-use practices between the native and non-native populations is also obvious in mining landscapes and clear-cut timberlands. These striking changes in land and resource use, from small-scale manipulation to wholesale extraction, have had long-lasting consequences for the local environments throughout the study area.

Data Requirements

One of the most obvious ways the archaeological record can contribute to the study of pyrodiversity and how post-contact landscapes have changed over the years is to conduct archaeological survey in areas that have been previously burned. These types of studies have found multiple cases in which dense, impenetrable vegetation has covered up major prehistoric habitation sites, clearly showing that climax vegetation communities were not favored by Native peoples at these locations, and that they took measures to prevent encroachments of that type. Such surveys have also found previously unknown feature types in otherwise well-studied areas (Schneider 2008).

Other approaches to this kind of study have been presented in a special issue of *California Archaeology* (2013; Volume 5[2]), where papers looking for evidence of prescribed burning through the analysis of plant macrofossils, archaeofaunal remains, phytoliths, and pollen spectra from the central coast could serve as a model for the current study area.

NATIVE AMERICAN ROCK FEATURES AND THE SPIRITUAL WORLD

Rock features made by Native Americans are important cultural resources in northern California, including certain parts of the current study area. Some were created deep in antiquity and some are still produced today by people following traditional religious practices. Based on what we know from the ethnographic and archaeological records, there are two geographic areas (with two differing traditions) within the study area where they occur in greatest abundance: one in northeastern California and the other in northwestern California.

The northeastern California area is centered on the original homelands of the Klamath Tribes (Ray 1963:xiii), but probably extends west into Shasta territory as well. Early interviews with local Indian people revealed that many rock features were built as part of religious activity geared toward obtaining power, as well as wisdom to help overcome periods of grief and hardship encountered during one's life (Ray 1963; Spier 1930).

A great deal of this activity was associated with boys' puberty rites. During these rituals, boys would often go up into the mountains or other remote locations on multi-day vigils with the goal of obtaining power to help them acquire property, be a good hunter, become a leader, and develop the means to deal with difficult issues later in life. Questing activities included fasting, exerting a great deal of energy by running, stacking rocks into large piles, and swimming in mountain pools. Eventually, due to their total exhaustion, they could receive power through visions received while sleeping or praying, often in the form of a song. Similar methods of exertion and rock stacking could be used later in life by a shaman to enhance his powers, or by more common people to cope with the death of a loved one, improve gambling success, or deal with other life challenges (Spier 1930:95–96).

Some of these early accounts, as well as information from modern Tribal members, show that a variety of other spiritual activities also occurred, and created a wider range of rock feature types in a diversified set of environmental settings. Many people, for example, would begin their spiritual questing and rock stacking at lower elevations, and did not move up to high elevation areas until they reached enhanced levels of training and understanding (Deur 2008; Spier 1930). It was also common to create modest features to enhance hunting success in places where game was especially abundant, and to build them adjacent to important plant gathering areas as well (Deur 2008).

The archaeological manifestations of these activities take many forms (e.g., single rock placements, multiple rock placements, and larger rock mounds). Other less common rock features include talus pits/ hunting blinds, rock ring structures, U-shaped prayer seats, and defensive structures. A study of the frequency and distribution of these features in and around the Klamath Basin and Modoc Plateau by Hildebrandt et al. (2015) found that most of the features recorded are either single rock placements or small multiple rock placements. They were rarely associated with residential sites, and differed from sites lacking features by being more frequently found in basalt landscapes, at higher elevations, in low-growing vegetation, and within the viewsheds of important mountain peaks; they also tended to be located closer to these mountain peaks than sites lacking rock features. These findings are consistent with the ethnographic record and highlight their spiritual significance to people past and present.

The northwestern California features are best known through the work of Chartkoff (1983). They tend to be concentrated in Yurok, Hupa, and Karok territory and are composed of multiple types including U-shaped prayer seats often found on high landforms with excellent views, small rock stacks often used to mark traditional trails leading up to the prayer circles, and larger cairns and rock alignments also associated with the trails and prayer areas. Although difficult to date, Chartkoff (1983:745) feels that they have considerable time depth and, based on largely modern ethnographic interviews, that they are "associated with patterns of traditional religious activity involving power quests, ritual and medicinal training, and individual prayer."

Data Requirements

Some of these rock features are quite subtle and difficult to identify in the field. As a result, it is important for field workers to familiarize themselves with this part of the archaeological record by reviewing previous archaeological studies on the subject, having discussions with knowledgeable archaeologists and tribal representatives about them, and making field visits to known sites. Upon finding them, it is important to describe the features in detail, including descriptions of their local environmental setting and viewshed. Although few formalized typologies exist, Hildebrandt et al. (2015) have developed one for south-central Oregon and northeastern California that might prove useful in the current study area as well.

Finally, as noted by Chartkoff (1983:745) with regard to the northwest California findings: "It is not known yet whether the complex is unique to northwestern California or is manifested over a wider

region." This also applies to the features studied by Hildebrandt et al. (2015) farther to the north and east, indicating that the two zones identified here could be more apparent than real. This question can certainly be answered by reviewing survey results from the intervening areas, especially within the northern reaches of our Klamath Mountains/North Coast Range Zone.

NATIVE RESPONSES TO CONTACT

With the exception of disease epidemics, contact between Native and non-native peoples in the Planning Area did not begin to truly disrupt traditional lifeways until the late 1840s and 1850s, with the rush for gold and the prospect of "free" land. The newcomers' greater numbers and more advanced technology (particularly in weaponry) gave them an overwhelming advantage in the battle over the land and its resources. Within a few decades, the Native people found themselves with little choice but to flee into marginal areas or find a way to survive in the new world order. As Tushingham (2013:145) has stated, "how northwestern California Indians [and other Native groups] survived during this period is an important research topic."

Delacorte and McGuire (1993), in their study of 23 sites in Owens Valley, divide the Contact period ino three phases that are applicable to the Planning Area as well (we have added the date ranges): indirect interaction and incipient contact [ca. 1800–1840], direct contact and cultural disruption [1840s–1850s], and post-contact economic assimilation and marginalization [post-1850s]. Those authors state that "post-contact culture change can be identified in the archaeological record" (1993:292), at the same time cautioning that "prehistoric artifactual remains (e.g., debitage and bone) can easily be mixed with [unrelated] historic debris, skewing the latter assemblages," and that "some historic accumulations may reflect multiple occupations that incorporate both Native and Euro-American components" that are unrelated (1993:294). As with any interpretations of archaeological components and assemblages, it is critical that we are able to identify datable, single-component sites, loci, features, or strata that represent discrete occupations (in Delacorte and McGuire's study, these were discrete house features).

Delacorte and McGuire (1993:34) are interested in "the timing, processes, and sequence of acculturative changes that eventually led to the collapse of native adaptations"; in other words, "the order and rapidity in which tradition pursuits were discarded for new economic opportunities afforded by the influx of European technologies, wage labor, and so forth." They argue that, all other things being equal, "elements of the subsistence economy should be abandoned in order of their relative returns to labor and only if new economic opportunities furnish an equal or greater return." By that theory, the use of rifles for hunting should be one of the first adaptations, given the longer range and greater force of such weapons. Where this is not the case, we can ask whether the use of rifles might be a disadvantage—for instance, when a group is in hiding and does not want to draw attention to itself by using such a noisy technology.

Not all changes were quite so abrupt, however. In many—perhaps most—cases, Native people absorbed new technologies and practices into their traditional ones, creating a continuum rather than a distinct break in tradition (Schneider 2015). For example, Native American groups of northwestern California were well known for their woodworking skills, particularly the construction of dugout canoes and large fishing weirs. When historic-era logging became a major local economic activity, many Native men adapted their skills to this new activity, and multiple generations found jobs in the timber industry. These jobs allowed some Native people to continue living in their traditional homelands, maintaining many of their traditional activities while at the same time adapting their knowledge to the new economy.

The adoption or adaptation of new artifacts and technologies was only one aspect of the Native response to contact with non-native peoples, however, albeit perhas the most visible one. Changes in

resource use, settlement patterns, and even religious practices also occurred. We have noted elsewhere in this document that Native hunters were often forced to kill the settlers' cattle, as their traditional prey (deer, elk, etc.) became more and more scarce. They also had to abandon many of their villages on the open grasslands or broad river terraces and retreat into less accessible "refuge" areas to avoid being murdered or herded onto reservations. Sometimes traditional religious practitioners were killed by their tribesmen for failing to cure those who had contracted the strange new diseases; in many cases, tribes adopted new religious practices, such as the Ghost Dance, hoping that higher powers would drive out the trespassers and restore the traditional order.

None of these methods was entirely successful, however, and ultimately Native tribes were "assimilated" into the dominant social order (some to a greater degree than others). Many children were taken away to "Indian schools," where they were forbidden to speak their native languages or wear their native dress. While being instructed in English, math, and other subjects, they missed the handing-down of traditional knowledge of things like medicinal plants, tool-making, and oral history. This created a social and cultural gap between generations, a gap that Native groups today are still working to heal.

It is also important to consider changes in social and family structure brought about by the arrival of non-native people. Nearly all of the early arrivals were men, and many of these men lived with or married Native women and fathered children by them: thus, not only was there cultural and technological blending, but kinship and genetic blending as well. Such households, where they can be identified through archival research, could provide a wealth of documentary and archaeological information on transitions in material culture, diet, household composition, and other aspects of daily life. In addition, the offspring of these inter-racial unions would, potentially, have faced discrimination from both sides. How they dealt with this discrimination, how they defined themselves, and whether they continued to practice the traditions of both parents, are all interesting research topics.

Data Requirements

Ritter (in Vaughan 1984:72-74) has developed a set of research questions for investigating acculturation and related issues of interaction between Native occupants at Salt Flat (TRI-862/CA-030-0075) and both Euro-American and Chinese immigrants. These questions have to do with how non-native materials were acquired and used, which goods were accepted and which were rejected (and why), whether the site contains evidence of revitalization movements or religious activities (e.g, the Ghost Dance, the Earth Lodge Cult, the Big Head Dance), and the like. To address these issues, as well as those outlined by Delacorte and McGuire (1993), Tushingham (2013), Delacorte and Basgall (2014), Van Bueren (2013), and others, will require careful examination of both the archival and the archaeological records; oral histories may also be very useful here. The most objective, unbiased source will be the archaeological record, provided that unmixed protohistoric/early historic-period contexts can be identified.

ETHNOGRAPHIC CONTEXT (by William Hildebrandt)

As outlined in the *Prehistoric Context* section above, the current study area includes a high level of ethnolinguistic diversity (see Figure 9). This level of diversity, however, is not matched by the economic and social adaptations among these groups. One of the most compelling examples of this situation comes from northwestern California, where the linguistically diverse Karuk (Hokan), Yurok (Algic), and Hupa (Athapascan) shared many traits with the larger Northwest Coast Culture Area, including plank houses, dugout canoes, salmon fishing, sea mammal hunting, ceremonial cycles, dentalium currency, use of wealth to acquire power and status, and an emphasis on the family (and not the tribelet) as the primary unit of social organization (Kroeber 1925). This regional cohesiveness can also be seen in other parts of the study area, and is often tied to ecological setting, sometimes (but not always) corresponding rather closely to the zones established for this study. As a result, the following discussion is organized according our zones, but we feel free to cross those boundaries whenever cultural affinities long recognized by early ethnographers are encountered.

It should also be noted that we give primary focus on those parts of culture that are most strongly linked to the archaeological record, so that they might help us interpret the archaeological record in the future. These include subsistence-settlement strategies, and the technological systems used to implement those strategies, and how these things relate to socio-political organization. Construction of a large communal weir, for example, requires the organization of a relatively large group of people, and should be reflected by significant amounts of fish bone in the archaeological record, while casual fishing by more mobile, smaller groups of people should produce a different outcome. Similarly, the structural aspects of the archaeological record should also vary depending on whether people were living in permanent villages with well-made houses, or practiced a more mobile settlement strategy with lower investment in their housing. This continuum of residential stability also appears linked to the establishment of formal cemetery areas, which has obvious implications for the archaeological record as well.

We are also interested in inter-group interactions, including amiable trade relationships where surpluses in one area may be redistributed to other areas experiencing resource short falls, increasing the benefit for all. Adversarial relationships are also important and will be documented, as these can create rigid boundaries between groups that restrict the flow of goods from one place to another, with some creating clear archaeological signatures (e.g., obsidian and shell beads).

Finally, the languages groups outlined on Figure 9 are simply that—they delineate what people spoke and do not represent the actual landholding groups at the time of European contact. These groups were local communities, composed of people closely bound by blood, marriage, and proximity of residence. As discussed below, Kroeber (1932) introduced the term "tribelet" for the type of territorial multi-family landholding community that prevailed across most of the study area, except in northwest California where the family was primary socio-political unit. As a result, the tribelet or family will be the focus of the following discussion.

UPPER KLAMATH

This zone largely corresponds to the Modoc and Shasta. The boundary between these two groups is often used to offset the Northeast California Culture Area (which includes the Modoc) from the Northwest California Culture Area (which includes the Shasta), as the former occupy high plateau lands, much of it lacking salmon and acorns, while the latter occupy large swaths of land on the headwaters of the Klamath drainage where acorns or salmon are often abundant.

Modoc

Much of what follows is derived from an ethnographic study conducted by McCarthy and Scotten (2004) as part of BLM's *Class I Cultural Resources Overview and Research Design for the Alturas, Eagle Lake, and Surprise Resource Areas* (King et al. 2004). As illustrated by Figure 9, only a small segment of Modoc land falls within the study area, as most of it extends east of the Cascade Range and a little bit into Oregon where it meets lands held by its close relatives the Klamath. The Modoc and Klamath speak separate dialects of the Klamath-Modoc language which is a member of the Plateau Penutian subphylum (Golla 2011:133). Their language was unintelligible to their neighbors in every direction (Ray 1963:xiv).

Traditional Modoc land centered around Lower Klamath Lake, Tule Lake, Clear Lake, and Lost River, the latter of which flows between Tule and Clear lakes (Kroeber 1925:318; Merriam and Talbot 1974:14; Ray 1963:xi-xii). Their western boundary with the Shasta, which is most relevant to the current study area, largely followed the Cascade divide, extending northward from Mount Shasta to near the Oregon border [Ray 1963:xii]. The southern boundary with the Achumawi is less clear, with Merriam defining it as "a straight line from Mt. Shasta through Glass Mountain to Goose Lake" (Merriam and Talbot 1974:14), while (Kroeber 1925:318) is more conservative, saying that it probably corresponds to uninhabited lands just north of the Pit River watershed.

Tribal territory was divided into three geographic areas, with named groups (tribelets) occupying each place (Ray 1963:202). They included the *Gumbatwas* ("people of the west"), the *Paskanwas* ("river people"), and the *Kokiwas* ("people of the far-out country"). *Gumbatwas* lands extended into the current study area, ranging between 14,000 and 4,000 feet in elevation, and encompassing a variety of habitats including broad river valleys, lake shore and marshes, alpine zones, timbered uplands, barren lava flows, and sagebrush flatlands.

In response to extreme seasonal differences in resource availability, the Modoc used a semi-sedentary settlement system. This was characterized by winter sedentism supported by stored foods, followed by warm season occupation of a variety of resource procurement camps. Permanent winter villages were established in the river valleys and could be quite large, occupied by up to 100 people (Stern 1998:451). They were composed of multiple dwellings, which included earth-covered lodges, mat lodges, and wikiups. The semi-subterranean, earth-covered lodge ranged from 12 to 35 feet in diameter, and was entered through a hatchway on the roof (Kroeber 1939:327; Ray 1963:146; Stern 1998:450). The mat lodge was erected over a shallow pit, framed with willow poles, and covered with tule matting (Kroeber 1939:326). This type of dwelling was more typically used in the spring fishing camps and summer villages. The third type of structure, also favored during the warmer months, was the wikiup, a portable dwelling made of bowed willows and tule mats. The wikiup was also used as a utility house in which foods were stored and women prepared food (Ray 1963; Stern 1998:451). Another structure used by the Modoc was the semi-subterranean sweat house. The sweat houses were for common use, and a sweat bath preceded the hunting of large game (Ray 1963:183; Stern 1998:451).

The spring marked the beginning of the sucker spawning runs, which would occur in a variety of places into the summer. Camps were set up close to the fishing grounds, and reused year after year. Women gathered desert parsley (*Lomatium* spp.) and as the fish run intensified, they devoted their activities to the drying of fish. At the end of the main sucker runs, people moved to "the digging grounds for epos, the root crop which played the largest role in the Modoc economy" (Ray 1963:181). Camps were set up in locations that were close to the epos grounds, as well as local streams and rivers where resident trout were available. Waterfowl eggs were also gathered at this time.

In early July, populations dispersed to some degree, moving from the root digging camps into a broader range of habitats to collect small seeds and hunt large game. Summer hunting focused largely on

antelope and bighorn sheep, the former on the plains and the latter in extensive lava beds that cover much of the local area. This was also the time that camas bulbs ripened and were gathered in the meadows throughout Modoc territory. In July, the yellow pond lily (*Nuphar polsepalum*) and its seeds, called *wokas*, became ripe (Colville 1904; Stern 1998:449). By August and September the men exploited a second run of suckers, while women harvested and dried several varieties of berries.

Upland hunting of mostly deer and elk began in late September, as well as a continued harvest of the slower maturing mountain berry crop. This was also considered a good time to visit the Medicine Lake Highlands obsidian quarries. People began moving back to the winter villages during October to rebuild their houses and make other preparations for the winter. Although stored foods were of critical importance during winter, communal antelope drives were organized early in winter, and trout were harvested during a December run. Solitary hunting and ice fishing also supplemented the diet during the long winter months (Ray 1963).

Social life was most elaborate when family groups congregated in the winter villages. Three types of leaders were recognized: a political leader or chief, a war leader, and a shaman. The role of chief was largely hereditary, but some leaders were also chosen for their oratory skills, and for their success in hunting, warfare, games and gambling (Kroeber 1939:320; Stern 1998:454). Also important to obtaining this position was economic and social support, as alliances were formed through marriage with other villages and regional areas.

The position of war leader, which was a formal office among the Modoc, was autonomous from that of political chief. A man became such a leader on the basis of his proven abilities in warfare, which was relatively well developed by the Modoc. War was undertaken for territorial encroachment by other groups, for retaliation, and to take slaves (Ray 1963:134–136). Their main adversaries were the Pit River peoples to the south, from whom they took captives. The captives were kept by the Modoc as slaves or traded north through the Klamath for the lucrative slave trade on the Columbia River (Ray 1963:134–135). Their relations with Pit River peoples were not uniformly bad, however, as shell beads and various textiles from Pit River were sometimes exchanged for furs, bows, and dentalia (Davis 1961).

Upon the death of a person, the body was immediately prepared for cremation by washing and dressing it in the person's best clothing; other gifts and finery might be added. Ideally, cremation took place within 24 hours of death. A wood pyre was built at the burning ground, usually a rocky prominence near the village. When the pyre, body, and offerings had been entirely reduced, the ashes were covered with rock. Sometimes a slave was killed and cremated along with a Modoc (Ray 1963:113–117). In addition to the cremation ground near Sheepy Creek, some of these cremation sites have been identified to the east of Tule Lake.

A man could develop a leadership role based on his abilities in warfare, which was relatively well developed by the Modoc. War was undertaken for territorial encroachment by other groups, for retaliation, and to take slaves (Ray 1963:134–136). Their main adversaries were the Pit River peoples to the south, from whom they took captives. These captives were kept by the Modoc as slaves or traded north through the Klamath for the lucrative slave trade on the Columbia River (Ray 1963:134–135).

Shasta

Multiple languages fall within the Shastan language family. *Shasta* and *Konomihu*, and probably *New River Shasta* were spoken in the central and western parts of Siskiyou County. A fourth language, *Okwanuchu*, was spoken at the headwaters of the Sacramento River, but appears to be a mixture Shasta and some unknown other language. Their ancestral territory is quite large, stretching from the Rogue River near Jacksonville, Oregon, across the Siskiyou Mountains to the upper Klamath River Canyon in

California, south to the headwaters of the Salmon, Shasta, Scott, and Sacramento rivers, and north again from Mt. Shasta to the upper tributaries (e.g., Little Butte Creek) of the Rogue (Golla 2011:91).

Recounting the annual subsistence-settlement system used by the Shasta is somewhat difficult, as this was not the focus of early ethnographers that studied them (e.g., Dixon 1907; Holt 1946), nor those that have produced more modern texts (e.g., Renfro 2009; Silver 1978). It is clear, however, that (like the Modoc), the Shasta used a semi-sedentary settlement system composed of relatively large winter villages supported by stored foods, followed by warm season occupation of a variety of resource procurement camps. Villages were usually situated at the confluence of major streams, often along the interface between the valley floor and adjacent mountains (Silver 1978). Some of the largest villages had formalized internal structure with an assembly house in the center and dwelling houses surrounding it. The larger villages also had sweat houses for the men and menstrual huts for the women (Dixon 1907; Holt 1946). Both the assembly and dwelling houses were semi-subterranean and constructed out of large wooden planks. The dwelling houses had steeply sloping roofs, while the assembly structures had flat roofs covered with dirt.

With advent of spring, most of the population moved out of the winter villages and occupied seasonal brush structures located at major fishing areas to for the spring king salmon run (Swezey and Heizer 1977). Fish were caught with a variety of methods including weirs, nets, harpoons, hook and line, and basketry traps (Dixon 1907). In addition to salmon, other riverine resources included suckers, eels, crayfish, turtles, and mussels, as well as steelhead, which had multiple runs during the year. Despite the riverine focus of the Shasta, canoes were rarely used or made (Silver 1978). A variety of large game were also pursued from the fish camps at this time of year, the most important being deer and elk (LaLand 1990).

A variety of greens were used in early spring and, though not emphasized by most ethnographic studies (e.g., Dixon 1907; Silver 1978), geophytes must have been an important resource as well (Gleason 2001; Todt and Hannon 1998). Dixon's (1907:424) equivocal perspective on this subject is illustrated by the following:

> Roots and bulbs seem to have formed a rather smaller portions of the food-supply here than in the central part of the State, although camass (*Camassia esculenta* Lindl.) and "ipos" (*Calochortus* sp.), with one or two other roots and bulbs, were eaten to a considerable extent.

This quote, combined with Gleason's (2001:207) ranking of epos as the second most important plant food in the Shasta diet (second to fall-ripened acorns), indicates that people moved out of the lowland fish camps during the late spring and early summer to higher elevation areas where this important crop was available. Other important summer foods included wild current, spiderbush berries, wild grapes, chokecherries, blackberries, elderberries, serviceberries, thimbleberries, and gooseberries, as well as manzanita and madrone berries (Hamusek et al. 1997). The hunting of large game also intensified during summer, again requiring a dispersal into upland areas.

The fall run of salmon began in late August and people again congregated in areas optimal for fishing. The focus on fishing during the fall differed from that in the spring because most of the fall harvest was stored for use during the winter. The most intensive form of capture involved the construction of a weir or dam across the river, with basketry traps set within them. According to Dixon (1907:428), these facilities were rare in Shasta territory, with only three known to him—at the mouth of the Shasta River, on the Scott River, and on the Klamath River at Happy Camp (the latter actually in Karok territory). Kroeber and Barret (1960:27) also report that small dams were built during the winter in Scott Creek Canyon and along Horse Creek.

Once the main late summer/early fall salmon harvest was completed, the all-important acorn crop became available. People left the lowlands for the hill country, harvesting a variety of species including black

oak, valley oak, and canyon live oak, occupying temporary small bark houses during these forays. Other nut crops harvested at this time included hazelnuts, in addition to those produced by the gray, ponderosa, and sugar pine. Once the harvest was in, people moved down to the lowland villages for the winter (Silver 1978).

Shasta social organization was based on the family. Some of the smaller villages were composed of a single extended family, and most consisted of multi-family communities. These villages were organized into larger divisions, not unlike the more formally defined tribelets identified by Kroeber (1925, 1962). The three main divisions in California were in Shasta Valley, Scott Valley, and in the Klamath River area, from the Scott River to Hornbrook. Each large village, and each of the above divisions, had a headman who was responsible for preserving the peace and helping resolve both intra- and inter-group disputes. When offenses were committed, the headman negotiated appropriate payment, often in the form of clamshell disk beads and dentalia. Other items of wealth used for exchange included *Olivella* beads, abalone ornaments, deer skins, and woodpecker scalps (Silver 1978).

Land ownership occurred at the village level, with well-defined territories for its members. Certain fishing places, however, were privately owned, and a few wealthy families had the right to build fish weirs at key locations. The weir owners would commission workers to help build the weir and pay them with a portion of the catch. Certain hunting grounds could also be owned (Dixon 1907; Holt 1946; Silver 1978).

The Shasta buried their dead. Only people who died far from home were cremated, with their remains brought back to the local area for burial. Each family had its own burial plot, and the person's possessions were either burned or buried with them. The dead person's dwelling was usually torn down and rebuilt for someone else, although the house of a headman was sometimes burned (Silver 1978).

Violent interactions with other Shastan groups, as well as with their more distant neighbors were commonplace. Revenge was the primary motivation of inter-group conflict. The Shasta fought with the Modoc, for example, in response to the Modoc's annual summer raids into California, and with the Wintu with which they had longstanding issues marked by regular battles (Merriam 1955; Silver 1978). The Shasta seemed to have more friendly relationships with the Karuk, Hupa, and Yurok, from whom they received acorns, baskets, dentalia, abalone, and other shells in exchange for pine nuts, obsidian blades, juniper beads, and "Wintu beads" (Silver 1978), the latter probably referring to clamshell disk beads.

SACRAMENTO VALLEY

The Sacramento Valley Zone is dominated by two major groups, the Wintu and Nomlaki (see Figure 9). The *Okwanuchu*, although occupying the northernmost part of the Sacramento Valley Zone, have already been discussed within the larger Shasta linguistic group, while the Konkow Maidu, who fall within the southernmost part of the Sacramento Valley Zone, will be addressed below within the Southern Cascade Foothills Zone. Due to the large degree of similarity between Wintu and Nomlaki subsistence-settlement patterns and social organization, they are combined into a single discussion.

The Chimariko lived directly west of the Wintu within the headwaters of the Trinity River. Due to the location of their homeland, it makes sense to include them with other groups living in northwest California. But this small group of Hokan speakers had little in common with their western neighbors (i.e., Hupa, Yurok, Karok, Wiyot, and Tolowa), all of whom are linked to the larger Northwest Coast Culture Area (see below). Instead, the Chimariko appear to reflect an older cultural pattern that appeared to be fading fast, as they were losing territory to both the Wintu and Hupa (Golla 2011; Kroeber 1925), and numbered only a few hundred people at European contact (Silver 1978). As a result, they are briefly discussed in this section after the Wintu and Nomlaki.

Wintu and Nomlaki

Wintu and Nomlaki are both members of the Wintuan language family. Other members of this family include Patwin and Southern Patwin. The Wintuan language family is a branch of the larger Penutian linguistic stock. Wintuan, previously named Wintun or Wintoon, has three divisions, Northern, Central, and Southern (DuBois 1935; Goldschmidt 1978; Kroeber 1932; Merriam 1967). Northern Wintun corresponded to the Wintu, Central Wintun to the Nomlaki (alternately termed Wintun and Nom'-lak-ke), and Southern Wintun to the Patwin. The Patwin "are well marked off culturally, and in speech as well, from the Wintun and the Wintu" (Kroeber 1932: 253).

The Wintu were originally a large population made up of nine local tribelets: *Nomtipom* (upper Sacramento Valley), *Winimem* (McCloud region), *Dau-pom* (Stillwater), *Elpom* (Keswick), *Klabalpom* (French Gulch), *Nomsus* (Upper Trinity Valley), *Norelmuk* (Hayfork), *Waimuk* (upper McCloud River valley), and *Dau-nom* (Bald Hills; DuBois 1935; LaPena 1978). Wintu territory covered parts of Trinity, Shasta, Siskiyou, and Temama counties, including the headwaters of the Trinity River and large portions of the upper Sacramento River drainage (LaPena 1978:324).

The Nomlaki were also divided into several tribelets, further separated by Hill dwellers and River dwellers (Goldschmidt 1951, 1978). River Nomlaki inhabited the Sacramento Valley and were composed of two local groups: the *Memwaylaka* (north region) and the *Puymok* (easterners). Hill Nomlaki occupied the foothill region to the west of the Sacramento River. There were four major Hill Nomlaki groups: *Waykewe* (Redbank drainage), *Waltoykewe* (north of Elder Creek), *Nomlaka* (Elder Creek to below Thomes Creek), and *Noykewe* (Grindstone Creek; Goldschmidt 1978:341).

Each tribelet was an independent social group that owned a well-defined territory, and was further organized into a series of villages and camps. Villages were the primary social, political, and economic units of the society. Wintu village sizes probably ranged from 20 to 150 men, women, and children, and included between five and 50 houses. These dwellings were made from a conically shaped frame of wood, using three or four main vertical poles which were lashed together with smaller stringers. The house pits were excavated one to three feet into the ground, and the backdirt was banked up around the perimeter to form a raised footing; bark and evergreen boughs were used to cover the structure. They were about nine feet (three meters) in diameter, and were typically occupied by three to seven family members (DuBois 1935; Goldschmidt 1951).

Some of the larger villages containing 50 to 70 people also had an earthen lodge. They were large circular, semi-subterranean structures measuring 15–20 feet in diameter. Earthen lodges served as gathering places for the men, who would enter through a hole in the roof via notches cut into its center pole, or by using a separate wooden ladder lashed together with grape vines. The pit was deeper than a standard house, excavated to shoulder depth. Rafters radiated out from the center post every three or four feet, while pickets were lashed at right angles to the rafters every one to two feet. The roof was covered with a mixture of bark, brush, and earth (DuBois 1935; Goldschmidt 1951).

Cemeteries were usually located away from the dwellings, with relatives buried close to one another. Decisions regarding the location of a specific grave were made by the old people who remembered the places where previous people had been interred. The body was placed in a crouching position with the elbows inside the knees, and it was tightly wrapped with deer sinew or rope. The grave pit was usually four feet deep, and sometimes lined with rocks and bark. Personal items like a bow and arrows, beads, or feathers were often interred with the body. Once the body and associated items were placed in the grave pit, it was covered with bark, stones, and soil (DuBois 1935; Goldschmidt 1951).

Settlement and subsistence strategies of the Wintu and Nomlaki are similar enough to be discussed as a single entity, as both tribes practiced a semi-sedentary collecting scheme. They lived in

permanent villages in the winter, subsisting mainly on stored food; they then occupied resource procurement camps, typically temporary brush shelters, during the spring and summer months (DuBois 1935). Kroeber (1925:354) states that valley people occupied permanent villages along the Sacramento River during winter, and moved to the adjacent plains near tributary streams during the dry half of the year. Hill people established winter villages where tributary streams reached the open valley, and moved to the mountains and hills during summer (see also Waugh 1995). Permanent villages were never entirely abandoned (Goldschmidt 1978), as a few elderly individuals would be left behind while the other villagers traveled to their seasonal camps to collect food. According to Goldschmidt (1978), each village had its own special site in the hinterlands that it moved to each summer.

The main food items collected for winter storage included salmon, acorns, deer, and manzanita berries (Merriam 1967). Additional resources included bears, rabbits, birds, steelhead trout, suckers, grasshoppers, seeds, tubers, clover, pine nuts, and other vegetable matter (DuBois 1935; Goldschmidt 1951, 1978; LaPena 1978; Merriam 1967).

Multiple runs of Chinook (king) salmon occurred in the Sacramento River, the most important being the fall run which began in October and extended until December. Several fishing strategies were used, some by a single person and others requiring a group. Single fishermen used elaborate composite harpoons to capture fish. Communal fish drives were used during summer when the water was low. With this technique, a net made from wild iris fiber was stretched across the river, and men with torches would drive the fish into the net at night; a dip net could also be used during communal fish drives. The most elaborate approach to fishing, and one of largest community projects among the Wintu and Nomlaki, was construction of a fish weir. Although little direct evidence from the Wintu is available, the Nomlaki pounded large posts (six to eight inches in diameter) into the bottom of the river with stones. Smaller stringers were lashed cross-wise with grape vine, and willows were then woven into the structure at one inch intervals, stopping the fish from moving upstream. Three pens (woven onshore) were attached behind gates left in the weir; platforms were often built on top of the pens to facilitate netting and spearing fish caught in the pens. Some gates were always left open to allow a portion of the fish to move up into adjacent territories, thereby avoiding hostilities with neighbors.

The acorn harvest also occurred in the fall, with families gathering within the most productive groves for this event. Unshelled acorns were carried back to the village where they were processed for immediate consumption or stored for later use. Acorns were stored in the shell and placed in bark lined pits. Those to be eaten were cracked, shelled, and pounded using a stone pestle and a hopper (basketry) mortar. The Nomlaki exploited acorns from no less than eight species of oak trees (Goldschmidt 1978; Merriam 1967), and the Wintu had access to at least six species (DuBois 1935). Acorns were harvested in large quantities, especially in summer/fall procurement camps, and were then cleansed and stored in dry granaries for use during the winter months.

The fall and winter diet was supplemented with the hunting of deer, bear, and rabbits. This was done either individually with bow and arrow, or communally with drives and snares. Bears were typically hunted in the fall, when they were more apt to be sluggish (DuBois 1935). Bear furs were highly prized possessions, used in trade and as burial wraps (Kroeber 1932). "The Wintoon say that they were 'strong on bears'…and were called 'Bear people' by the Nose or Yahnah" (Merriam 1967:265).

With the advent of spring, people moved out of the permanent winter villages into the hill country to harvest a variety of plant foods, including clover, miner's lettuce, other greens, and a number of tubers. Summer brought a new set of plant resources, among them multiple species of berries (e.g., manzanita, skunk bush, and service berries). This was also the time for a variety of small seed resources, especially in the Bald Hills region, the specialty being "cotton flower" or salal (DuBois 1935).

The spring salmon run began in May and continued until October, and salmon were caught both individually and in groups, but not with the large communal weir. Spring salmon were not dried when caught because they were considered to be too greasy. Instead, the fish were laid in a pit lined with hot rocks and covered with additional preheated stones. They were eaten after cooking, and any remaining meat was boned and flaked. The flaked flesh was then dried and pulverized into salmon flour, which could be stored for a considerable amount of time (DuBois 1935).

Both Wintu and Nomlaki tribes were non-egalitarian societies. A wealth complex and secret society among Nomlaki groups was described by Goldschmidt (1978). Items associated with the wealth complex included clamshell disk beads, tubular magnesite beads, and bear skins. A limited number of adult men were initiated into a secret society based on social and/or political status, and these men had more power in public matters. They also had the right to engage in trade of wealth objects and exerted control over most of the skilled crafts and professions. Flexed burials were likewise associated with the Nomlaki wealth complex (Goldschmidt 1978).

Shamanic doctors were also important members of the social group. They were initiated once a year, and the position was open to both men and women. The ceremony took place in an earthen lodge, where the initiates would dance through the night until they received the supernatural spiritual power. Every shaman was expected to be a good singer, and possess several doctoring songs linked to his or her special spirits. Doctoring often began with the smoking of wild tobacco to help bring on the spirit helper through a trance, after which the sickness was usually sucked out of the body. Shamanistic prophesy was equally as important as doctoring, and also took place during a tobacco induced trance. Prophesies covered a wide range of subjects, including predictions about the location of game and the success of hunting trips, the future health of certain individuals, and upcoming weather. Poisoning was also known to occur, in which an unsavory shaman would send sickness to his or her rivals and enemies (DuBois 1935).

For the Wintu tribe, inter-village trade comprised the majority of exchange; inter-tribelet and inter-tribal exchange was less common but perhaps of more economic importance. Specialty craftsmen in Wintu villages would exchange their wares with each other, and women would exchange baskets (LaPena 1978). Inter-tribelet exchange in the Wintu tribe consisted mainly of trading fish for seeds and acorns. The McCloud region was the richest in food supplies in the Wintu territory (DuBois 1935), particularly with its access to salmon runs. As such, food exchanges "were frequent between the Wintoon of the McCloud and those of the Trinity" (Merriam 1967:265) as well as others. Bald Hills Wintu obtained salmon from the more northerly groups by trading clam-disk money, deer, salt, and vegetable foods (DuBois 1935). Shasta Indians to the north provided Wintu groups with dentalia and obsidian, but the Wintu also obtained obsidian directly from Glass Mountain, which is approximately 60 miles to the northeast (LaPena 1978), as well as from the nearby Tuscan sources within Yana territory.

Similar to the Wintu, internal trade between families in the same village was the most frequent form of exchange amongst the Nomlaki. As a result of occupational specialization, neighbors would need to purchase different tools and supplies from each other. Inter-tribelet exchange, particularly between Hill and River Nomlaki, played a key role in the culture. This trading involved the "transfer of the surplus produce of one environment for the different produce of another" (Goldschmidt 1951). Hill Nomlaki traded acorns, seeds, other vegetable items, and terrestrial animals for salmon and other aquatic animals from the River groups. Nomlaki groups also participated in a north-south trading system that extended from the San Francisco Bay to Shasta territory. The Bay region tribes traded shell and shell beads to tribes in central California for obsidian, animal pelts, and yew wood (Goldschmidt 1951). Kroeber (1932:358) notes that "white bivalve shells, dautede, perhaps small clams, that came from a distance and were worn in the ears, were rated at 200 beads; and belts of twenty brought up to 4,000 beads."

Disputes among members of the group often stemmed from criminal behavior. Murder sometimes demanded blood revenge, but the chief could often negotiate a payment to the grieving family and avoid capital punishment. Problems stemming from thievery could be solved by returning the stolen item, but the chief was ultimately responsible for assigning a price for the unsanctioned behavior of the guilty party. Finally, habitual trouble makers could be, with the sanction of the chief, soundly beaten by the group. On rare occasions certain people were killed if they refused to change their behavior.

Large dances and other social gatherings were an important part of life, and were organized by the chiefs. Before a big event, runners were sent out to outlying villages to invite the guests and tell them what to bring. They were often organized around times of food surpluses like big pine nut harvests and salmon runs. Some people had to travel up to two days to reach a celebration, and each community did their best to bring plenty of food and a variety of trade goods, both being measures of prestige. Sometimes 200–300 people would come to these "Big Times," where the feasting, dancing, and gambling would last from three to five days. Gambling contests were a huge activity, with fortunes of shell money and other valuables changing hands on a regular basis.

Although the Wintu and Nomlaki usually had friendly relationships with outsiders and other tribelets within their territory, they did have traditional enemies that were viewed with caution. The Bald Hills Wintu, for example, did not like the *Nomsus* ("west people"), who were probably Athapaskan speakers from the uplands like the Lassik or Nongatl. They also had boundary issues with the *Noze* (Yana) who occupied the hills to the east, and many of the Wintu groups referred to them as "enemy" and "strangers." When inter-group conflicts did arise, they were often solved through negotiations between the chiefs of the groups or individuals involved. But when negotiations failed and inter-group violence erupted, chiefs would organize tribesmen to fight, but not necessarily lead them into battle. These were usually small-scale battles caused by local problems, such as the murder of a relative or the theft of women by neighboring peoples (DuBois 1935; Goldschmidt 1951).

Chimariko

Chimariko territory measured only about 35 x 30 kilometers, and occupied the headwaters of the south and main forks of the Trinity River (Golla 2011; Silver 1978b). According to Kroeber (1925:109), they "were one of the smallest distinct tribes in one of the smallest countries in America." They appear to have been divided into two tribelets (Trinity River and South Fork), each of which a limited number of villages (Golla 2011). Each village had a sweathouse and several smaller family dwellings. They were circular in shape with single ridge poles that were covered with bark and earth, showing much greater affinities to the Wintu than to their western neighbors who built plank structures.

The Chimariko had an abundant food supply, with large quantities of salmon and eel from local streams and an abundant acorn crop available from the surrounding uplands; both were stored for winter use. Other important subsistence resources included deer, elk, and bear, as well as a variety of plant foods like roots, small seeds, berries, and pine nuts. Because of the richness and small size of their territory, the lowland villages were permanently occupied and the upland seasonal procurement camps were used on only a limited basis. Due to the permanent nature of their villages, the Chimariko buried their dead in formalized cemeteries located away from their dwellings.

Because the headwater streams in their territory were relatively small, canoes and formalized weirs were not used (Kroeber 1925; Kroeber and Barret 1960). Instead, a variety of nets were sufficient to obtain the desired amount of fish. Most fishing, hunting, and gathering places were communally owned, but tobacco plots could be owned by individuals. Differential wealth did develop within the community and, like their western neighbors, obsidian blades, redheaded woodpecker scalps, and dentalia were all valuable commodities. Little is known about their trade relationships, as Davis (1961) notes only one item

of exchange—obsidian from the Wintu. They were on bad terms with the Hupa, who regularly raided their territory and encroached on their land. Although they were also losing land to the Wintu, they were on more friendly terms with them, and inter-marriage and bilingualism were common (Kroeber 1925).

COAST RANGE AND KLAMATH MOUNTAINS

Native American groups living in northwest California have long been associated with the larger Northwest Coast Culture Area, differing significantly from other groups in California (Kroeber 1939). The Northwest Coast Culture Area extends from Canada and Alaska (including groups like the Tlingit and Kwakiutl) south to near Cape Mendocino, where groups like the Tolowa, Yurok, Wiyot, Karok, and Hupa represent the southernmost expression of the culture. Kroeber (1925, 1939) saw the Yurok as the nucleus of this expression in northwest California, as they had the strongest linkages with groups to the north in the areas of technology, art, and ceremonial life, while the neighboring Tolowa, Wiyot, Karok, and Hupa had a secondary degree of relatedness.

All of these groups lived in relatively high densities, and occupied permanent coastal and interior riverine settlements. Many of the settlements were supported by the storage of acorns, and the use of large communal fish weirs. River canoes, large oceangoing canoes, composite harpoons, and redwood smoke houses also facilitated the harvest and storage of fish and marine mammals. Wealthy families owned many of these capital-intensive technologies, as well as important resource areas such as acorn groves, river eddies for obtaining fish, and portions of offshore sea lion rookeries (Drucker 1937; Goddard 1903; Goldschmidt 1951; Kroeber 1925; Waterman 1920).

Individual households possessing superior pools of labor could generate substantial food surpluses and other items of wealth, ultimately separating themselves from the less successful family units. Unlike most populations elsewhere in California, these northern groups lacked the tribelet organization originally defined by Kroeber (1925, 1936). Instead, Goldschmidt (1951) argued that the concept of village and tribe was essentially non-existent, as the individual or immediate family took precedence. "Though persons were identified by their village of residence and their tribe of origin, neither of these groups had any direct claim upon the action of the individual" (Goldschmidt 1951:507). There was a universal concept of privately owned property, including money (e.g., *Dentalium*), which was linked to differential wealth and power within the population (Fredrickson 1984; Gould 1975; Kroeber 1925).

Moving south within the current study area, the southern Athapascan peoples (Chilula, Mattole/Bear River, Nongatl, Lassik, Sinkyone, Wailaki, and Cahto), as well as Yukian speakers (Yuki, Huchnom, and Coast Yuki) and the Northern Pomo (see Figure 9) all fall within Kroeber's (1939) California Culture Area. Rather than focusing on maritime and riverine resources, they relied on a broader array of terrestrial foods, most notably the acorn. Tribelet organization took precedence, and groups living along the coast did not venture out to sea like the Yurok and Tolowa. Instead, they practiced a littoral adaptation where marine resources like shellfish and small schooling fish were obtained on a seasonal basis from the shore or near-shore locations. This economic system often resulted in a higher level of residential mobility than that observed farther north, as many people used a seasonal round that encompassed both coastal and interior habitats.

As a result of these patterns, the following discussion is organized into three sections: (1) the Core Northwest California Groups (Tolowa, Yurok, Wiyot, Karok, and Hupa); (2) Southern Athapascan Groups (Chilula, Mattole/Bear River, Nongatl, Lassik, Sinkyone, Wailaki, and Cahto); and (3) Yuki and Northern Pomo Groups.

Core Northwest California Groups

The Tolowa, Yurok, Wiyot, Karok, and Hupa all lived in semi-subterranean plank houses located in permanently occupied villages. Major villages were located in strategic foraging areas such as estuaries and lagoons, protected river mouths, and high quality fishing areas along interior streams. Two types of houses were used, family houses and sweat houses. Construction of both types of houses required a great deal of labor to split and prepare the redwood planks with adzes, mauls, and wedges. There were usually three family houses for every sweathouse, forming what was known as the sweathouse group, which was organized along family lines (Gould 1966; Kroeber 1925; Tushingham 2009).

Occupied by women and children, family houses were square or rectangular with maximum dimensions ranging between 15 and 21 feet. The walls were made of upright planks, and the plank roof was held up by a single roof beam. Although the Tolowa houses were single pitched, houses made by the other groups typically had double-pitched, gabled roofs (Tushingham 2009). Sweat houses were occupied by men and post-pubescent boys, and were smaller than family houses, measuring roughly 12 feet (3.7 meters) in maximum dimension. They were entirely subterranean and the single-pitched roofs were covered with soil. Both houses often had stone pavers placed at their entrances and around the internal hearth (Gould 1978).

As mentioned above, the household was the fundamental economic and social unit, lacking the higher level political organization of the tribelet that is found elsewhere in the study area. In addition to a variety of wealth items like obsidian blades, white deerskins, and dentalium shell money, all valuable property was privately owned, including mussel beds on offshore rocks, beaches where whales might wash up, salmon fishing spots, oak groves, and certain items like oceangoing canoes (Kroeber and Barret 1960). Each family also had its own cemetery plot placed away from the dwellings, where the deceased were often buried with their possessions within a series of redwood planks (Bright 1978; Elsasser 1978; Gould 1978; Pilling 1978; Wallace 1978).

All groups lived in their permanent villages during the winter, relying on stored resources. With the advent of spring a variety of greens and root crops were harvested, and people took advantage of the spring salmon run. For those living on the coast, sea mammal hunting was a major enterprise, in which hunters would venture out to sea in oceangoing canoes to exploit offshore sea lion rookeries (Gould 1975; Hildebrandt and Carpenter 2006, 2011). Deepwater fishes were also obtained on occasion, but they were much less important than marine mammals due largely to the abundant anadromous fishery (Hildebrandt and Carpenter 2006, 2011) and surf fish resources that could be obtained during the summer (Tushingham and Christiansen 2015; Tushingham et al. 2013; Whitaker and Tushingham 2014).

Smelt were the primary surf fish harvested along the northern beaches. Once they began to run, the fish could be mass-harvested as they swarmed to lay their eggs and spawn in shallow water. Men caught the fish with V-shaped nets, and the women dried them on the beach for approximately three days while occupying fish camps located nearby (Gould 1966; Kroeber and Barret 1960; Tushingham et al. 2013). Once dried, the fish were returned to the main village where they could be stored for winter use. The runs could last a month, representing one of the most important subsistence resources on the north coast (Tushingham and Christiansen 2015).

Fall brought the acorn harvest and the large salmon run, both of which were major resources for all people living in northwest California. Acorns ranked second only to salmon, and were stored and processed in ways similar to other groups in California. Salmon (both Chinook and silver), as well as other anadromous fishes like steelhead, lamprey, and sturgeon, were obtained using a variety of technologies ranging from large communal weirs to simple fish spears and poisons (Kroeber and Barret 1960). All ethnographic accounts emphasize the importance of this resource. Rostlund (1952), for example, estimates that the Yurok may have harvested about 34,000 kilograms of fish a year, or about 110

kilograms per person (see also Baumhoff 1963). Most of this harvest occurred during the fall when the large weirs were constructed and produced a winter's supply of fish in a relative short period of time.

The largest weir was built by the Yurok along the Klamath River at Kepel. It was constructed during low water in September, when the river was uniformly six feet deep and no greater than 80 yards across. It was a complex barrier made of logs and poles with small openings allowing fish to enter enclosures or pens where they could be easily caught. Construction began by driving a series of vertical piles into the river bottom, which were shored against the current with slanting braces. Stringers were lashed between the piles, and hundreds of smaller stakes were placed upstream of the stringers to form the body of the dam (Hildebrandt and Carpenter 2006, 2011; Kroeber and Barret 1960).

According to Kroeber and Barret (1960:12), strict construction techniques were used, some imbued with ceremonial significance.

> The weir was an elaborate structure built in ten named sections by ten groups of men…Vast numbers of fish were taken during the ten days that the dam was allowed to stand. After that it was deliberately torn down, at least in part…Its destruction again cleared the channel and permitted the fish to ascend the stream to spawn, at the same time providing the upriver residents with their essential supply of fish.

The absence of tribal-wide political authority seems to have affected the scale of intergroup conflict as well. Typical causes for conflict were murder, insult, or trespass and poaching, but most groups "recognized no crimes against the tribe or community" (Bright 1978:185). Instead, most crimes could be worked out through payment from one family to another. There were cases in which conflicts escalated to a higher level and multiple kinsmen would gather together and attack a neighboring village, claiming women and canoes, and burning down structures. Such a multi-battle feud occurred between the Yurok and Hupa, but was ultimately settled with payment of large quantities of wealth by each side (Kroeber 1925:51).

Many items of wealth were obtained through exchange, such as the large obsidian blades and dentalia acquired from eastern and northern neighbors. In addition to other forms of treasure (e.g., redheaded woodpecker scalps), an active trade of subsistence commodities took place, with dried smelt, shellfish, and seaweed moving into the interior, and acorns and pine nuts coming back in exchange. Redwood dugout canoes were also an important trade item, originating among the coastal groups and distributed to those living in the interior (Davis 1961).

Southern Athapaskan Groups

As outlined above, the southern Athapaskan groups lacked the maritime adaptation of the people living to the north. In contrast to the Yurok and Tolowa territory, where sea mammals could be harvested from the offshore rocks and islands in oceangoing canoes, the coastal territories of the Mattole/Bear River and Sinkyone lacked offshore rookeries and oceangoing canoes were not used (Jobson and Hildebrandt 1980; Hildebrandt 1984; Hildebrandt and Jones 2004). Instead, terrestrial mammals were much more important than marine mammals (Hildebrandt 1984) and deep water fishes were rarely caught (Nomland 1935, 1938; Tushingham and Christiansen 2015).

Another important distinction between the two groups is the anadromous fishery. First, southern Athapaskans did not benefit from a major spring salmon run (Baumhoff 1963:174) and, second, the fall runs did not reach the magnitude of those to the north. The latter is reflected by the construction of weirs, which were simpler than those of the Tolowa, Yurok, Wiyot, Karok, and Hupa. The Mattole, for example, built weirs from a series of vertical stakes placed in knee-deep water supported by multiple rocks. The stakes were infilled with brush, and three or four gaps were left for the fish to pass through. "Such a weir was the work of

a single day for a half a dozen men, or even a smaller number." (Kroeber and Barret 1960:26). The Sinkyone weirs "were merely a wall of rocks or a line of brush built across a stream" (Kroeber and Barret 1960:26).

All groups lived in semi-permanent winter villages, but expanded into outlying areas during the warm times of the year, showing a higher degree of residential mobility than people living farther to the north. Houses differed too, as, for example, the Wailaki winter dwellings, which were "made of split slabs, standing upright or sloping in at the top to form a conical house" (Baumhoff 1958:176). Winter subsistence relied on stored foods that included fish, game, and plant foods such as acorn, gray and sugar pine nuts, hazelnuts, and buckeye. Emphasis on wealth was much less developed than it was among the northern groups, restricting status differentiation among the families belonging to a tribelet. They did, however, use family cemetery plots to bury the dead.

In spring, people moved out to collect greens (especially clover), soap root, angelica, and a variety of other roots and bulbs. By late spring and early summer, they moved to seasonal camps up in the mountains. Usually only a few families would stay together in these camps, where men hunted deer and small mammals, and women collected a variety of plant foods such as berries and small seeds; steelhead and resident trout were also caught from some of the larger streams.

In September or October, when the acorns were ripe, people would return to their winter villages. Each family built a new house, and began to harvest acorn, buckeye, and peppernuts for immediate consumption and storage; deer meat was also smoked for storage at this time. After the first rain, the salmon ran again and these were processed for winter storage as well.

Most warfare among tribelets or families was retaliatory in nature, a response to murder, witchcraft and, to a lesser extent, abduction and rape. Most was small scale (on the extended family level), and often accompanied by mythical stories (Kroeber 1925:152). There were, however, some cases in which larger-scale conflicts took place, as when multiple Matttole/Bear River tribelets joined forces to fight the Wiyot along their shared border (Elsasser 1978).

Intergroup exchange appears to have been less developed among the southern Athapaskan groups than with their northwest California neighbors, perhaps due to the lower priority placed on the development of wealth and large world-renewal ceremonies, both of which required significant quantities of exotic materials. Davis (1961) does note that an active shell bead exchange network was in place, with dentalia coming in from the north and clam disk beads arriving from southern and interior groups.

Yuki and Northern Pomo Groups

The Northern Yukian language include Yuki, Huchnom, and Coast Yuki, each of which represent distinct dialects or emergent languages (Golla 2011). Yuki speakers lived in and around Round Valley along the Middle Fork of the Eel River, and were composed of six tribelets. Their territory was quite diverse, ranging from 1,000 to 7,500 feet at the crest of the North Coast Ranges, where their eastern boundary joins that of the Nomlaki. The principal village of a tribelet could include up to 25 family houses, in addition to a large dance house used for ceremonial gatherings of all members of the tribelet (Foster 1944).

Family houses were conical in shape, made with bark, and had no central post; the floors were excavated to a depth of about one foot. The main dance houses were 30 to 40 feet in diameter and excavated to a depth of four to five feet. They had center posts and were covered with soil. Small storage pits were also common, as were earth ovens used to bake a variety of items, including accord bread. Upon death, people were buried in flexed position within family plots, and interred with their personal possessions (Foster 1944).

The Yuki seasonal round has been summarized by Stewart and Fredrickson (1980), based largely on the ethnographic accounts of Foster (1944). During winter (approximately November through

February) they lived in their winter villages relying on stored foods that included acorns, pine nuts, hazelnut, peppernut, buckeye, and dried venison and fish. Spring (March to April) brought fresh food to the diet, including a variety of clovers, soaproot shoots, and angelica roots. By late spring/summer (May through August), people moved out of their winter villages to collect a diverse assortment of foods as they became available. Berries and small seeds were collected from a variety of locations, deer and small game were hunted, and steehead and resident trout were obtained from the larger streams. These outward movements eventually resulted in the establishment of seasonal base camps, many of which were located in upland areas. Finally, with the arrival of fall (September through October), deer hunting intensified, and acorn and pine nut collection began, all with the goal of creating winter stores. Fall salmon also ran at this time, and they were captured with simple brush weirs and dip nets (Foster 1944).

The Huchnom lived along the South Fork of the Eel River. Their adaptations were quite similar to the Yuki, but differed in that they practiced cremation, similar to their Pomo neighbors to the south (Miller 1978).

The Coast Yuki included 11 tribelets along a 50-mile stretch of the rugged Mendocino coast. Each tribelet had communally owned territory extending from the ocean into the interior. They occupied beach camps during the summer, relying on shellfish and surf fish (largely smelt), with the latter dried and stored for future use. Summer houses were simple brush huts that were rebuilt every year. They did not use marine watercraft (Gifford 1939; Miller 1978).

Similar to other Yukian groups, their interior winter villages included conical, bark-covered family houses, and each tribelet had a larger, more substantial assembly house. They also relied on the fall salmon run and acorn harvest, the former assisted by the one of the simplest types of weir reported by Kroeber and Barret (1960); it was composed of a log laid across the stream with a single post driven in the middle for reinforcement.

Only a small sliver of Northern Pomo territory enters the current study area (see Figure 9). This zone was occupied by a single tribelet known as the *Mato* whose territory centered on Sherwood Valley, which included the headwaters of the Eel River and most of the Noyo River (Golla 2011). Similar to the Coast Yuki, they inhabited the coast during the summer, focusing on shellfish and smelt, and spent winters in villages in the interior, relying on stored acorns and salmon (McClendon and Oswalt 1978).

Small-scale warfare was common among the Yuki, with their primary enemies being the Nomlaki, Kato, and some Pomoan groups. Revenge was the primary motive, and targets were often killed, with the decapitated heads of the vanquished used in victory dances. Most conflicts were eventually resolved when the "side suffering the heavier losses might be willing to quit, in which case the victors would be notified and, with the chief's consent, a payment made to the losers and friendly relations resumed" (Kroeber 1925). Northern Pomo, as well as other Pomoan groups, sometimes formed larger multi-tribelet confederations, initiating war in response to "poaching, poisoning (witchcraft), abduction of women and children, theft of goods, or to protect or acquire prime resource areas" (Bean and Theodoratus 1978:298). Sometimes these relationships became permanent alliances, which was the case among the Northern Pomo and Yuki (Bean and Theodoratus 1978).

Yuki trade relationships were primarily internal, and with their Northern Pomo neighbors. Coastal foods were exchanged for clam shell disk beads and dentalia, and salt was obtained from Northeastern Pomo groups. Pomo trade was more highly formalized through use of the trade-feast system, where multiple tribelets would gather together, exchanging goods, services, and marriage partners across a wide range of ecological zones. These feasts helped maintain intergroup ties, and distributed resources from places with surpluses to those falling short, with the latter groups repaying the debt through a system of delayed reciprocity (Bean and Theodoratus 1978; see also Hildebrandt 2009).

SIERRA NEVADA

The Sierra Nevada zone and adjacent Sacramento Valley lands largely correspond to lands occupied by speakers of Maiduan languages. These closely related languages include Konkow, Chico Maidu, Northeastern (or "Mountain Maidu"), and Nisenon. The current study area largely corresponds to Konkow and Chico Maidu territory (Golla 2011:137).

Konkow

Konkow was spoken along the Feather River watershed from just north of Marysville-Yuba City up to the Plumas County line. Twelve tribelets have been recognized, and there appears to be a dialect and cultural boundary between what Kroeber (1932) calls the "Hill Konkow" above Oroville and the "Valley Konkow," people who lived downstream in the Sacramento Valley. Chico Maidu was spoken by multiple tribelets along the Sacramento River, including people living west of the river. The Chico Maidu and Konkow languages are quite similar to one another (they could actually be dialects; Golla 2011), and Kroeber (1932) has included the Chico Maidu into his "Valley Konkow" group based on their cultural similarities. Following Kroeber (1932), we will discuss the Konkow as a single group.

Konkow tribelets subsisted on a diverse diet that included multiple species of fish, mammals, birds, insects, and plants, with acorn accounting for the largest portion of diet. Their main villages were relatively large, housing as many as 150 to 200 people in up to 20 family homes built around a central dance-house (Dixon 1905; Kroeber 1925). The large degree of storage practiced by the Konkow (especially the Valley Konkow) allowed them to remain in their villages year-round, with logistical forays out to resource patches such as seed-bearing fields, acorn groves, and fishing and hunting areas. The tribelet territory was communally owned by members of the group, which provided rights to hunt, fish, and gather within the established boundaries. Territories were small, with Dixon (1905:201) noting that "twenty miles was an unusual distance to go, and few went to greater distances from their homes."

While the territory as a whole was owned communally, private property also existed: a man's nets, bows and arrows, spears, canoes, clothing, and house were all private, while a woman's baskets, utensils, pestles, mats, and digging sticks were her property. Some fishing holes were also privately owned by families, though others could fish in them if they received proper permission. The right to erect drive fences for deer hunting was similarly owned by families (Dixon 1905:223–225).

Community territorial boundaries appear to have been rather strictly demarcated and guarded. Boundaries were determined through meetings between village headmen; once established, these boundaries might be marked by a symbol known to all which was carved into rocks at the edge of a territory. One such rock was reported by Ritter and Parkman (1992) and could indicate that this practice occurred in the prehistoric past as well. Dixon also reports that "each tribe or group of communities kept its boundary-lines constantly patrolled by men, who were to see that no poaching took place, and that the rights of each tribe were respected" (1905:225).

Three types of houses were constructed: (1) large circular, semi-subterranean earth-covered houses; (2) smaller, conical huts built on the surface; and (3) temporary wind-breaks constructed during the summer (Dixon 1905:168–172). It appears that the more-sedentary valley peoples rarely used the latter two types, as they remained in or near their central villages much of the year. The subterranean type was used for residential houses, sweat houses, and in larger form, as a central dance house in important villages. House sites were excavated to a meter in depth and measured between six and 12 meters in diameter. At least two main oak posts were erected in the center of the depression, with a row of shorter posts on either side. The sides of the pit excavation were lined with wood or large slabs of bark, and roof

beams were run from the edge of the excavation to the center posts. Large pieces of bark, branches, and leaves were placed on these beams, which were then covered with dirt excavated from the hole.

Granaries were also built in and around the village. These were made by planting poles in a circle about a meter in diameter and twining willow between them to make a cylindrical receptacle capable of holding approximately one-third of a cubic meter of seeds or nuts (Dixon 1905:176).

After subsisting largely on stored foods during the winter, people began to forage away from the village during the spring in pursuit of a variety of greens such as clover, sour dock, and waterleaf. Most importantly was the spring salmon run along the Sacramento and Feather rivers and their tributaries, where the fish were harvested using a variety of methods. In addition to dip nets, seines, basketry traps, spears, harpoons, and hook-and-line, the Konkow built simple weirs (also called guide fences) designed to direct fish through openings in the fence where they could then be speared. Eels and a variety of resident fish were also important components of the diet (Dixon 1903; Kroeber and Barret 1960).

During summer, small seeds (particularly grasses) were harvested both for immediate consumption and for storage through the winter (Dixon 1905:188). Roots and bulbs were gathered with a digging stick and boiled, roasted, or eaten raw. Manzanita berries, available in the foothills, were stored for winter and used to make manzanita cider. Women and children also gathered large insects such as grasshoppers, crickets, and locusts (Dixon 1905:190). To gather these insects, they excavated a shallow pit and set the surrounding grass on fire, driving the insects into the pit where they were collected "by the bushel" (Dixon 1905:191). These too were dried and stored for winter use.

Large and small game were hunted throughout the year, with deer inhabiting a wide range of environments, and elk and pronghorn favoring more open, grassland habitats. The acorn harvest occurred during the fall, and large quantities of nuts were stored in the above-ground granaries. Dixon (1905:181) reports a dozen varieties of acorn harvested, with the most popular being black oak, canyon live oak, and interior live oak. Gray pine and sugar pine nuts were also harvested and stored at this time (Dixon 1905). Granaries were apparently capable of holding enough acorns to last between one and two years, facilitating year-round occupation of the valley floor and providing a fallback food during periods of scarcity. Salmon fishing again became important at this time, with large amounts caught and stored for winter use.

Given the presence of tribelet property and distinct social boundaries, inter-group conflicts developed from time to time, with the Yana being a common foe. Although raiding and ambush were the typical forms of conflict, there were instances where multiple villages would band together for a fight. Dixon notes that inter-tribelet conflict included violent bouts of raiding and ambush using clubs, spears, and arrows: "Prisoners, if men, were usually killed…Slaves were not taken or used. As a rule, the slain were scalped…it is custom to torture captives of the male sex" (Dixon 1905:207). He also notes that "if a person of distinction were killed in an attack, and the body or head could be secured, it was tied to a pole on returning to the home village, and treated as described [tortured and despoiled] in the case of a live prisoner" (Dixon 1905:207). This narrative is consistent with the four scalped and decapitated skulls found in the archaeological record by Hildebrandt and Kaijankoski (2011) near Hamilton City.

Dixon (1905:201) notes that the Maidu were not particularly active traders. They are thought to have traded mainly with the Wintun to the west and north, acquiring beads which they then traded to tribelets in the eastern Sacramento Valley for salt, obsidian arrowheads, bows, raw toolstone, and pine nuts.

SOUTHERN CASCADE FOOTHILLS

This zone includes portions of Pit River (Achumawi and Atsugewi) territory and most of traditional Yana (Northern, Central, and Southern Yana) lands.

Achumawi and Atsugewi

Pit River Indians have traditionally inhabited a vast area of northeastern California which encompasses the mountainous Pit River drainage, from southern Goose Lake all the way to Big Bend in Shasta County. Pit River tribes are comprised of two groups: the Achumawi, consisting of nine tribelets, and the Atsugewi, with two tribelets (Garth 1978; Kniffen 1928:303; Olmstead and Stewart 1978). The Achumawi and Atsugewi languages form the Palaihnihan family, a member of the Hokan stock; each language contains dialects which correspond to the tribelet divisions (Golla 2011; Olmsted 1966; Shipley 1978).

The current study area includes only the westernmost margins of their original territory. The Achumawi included nine bands (*Astariwawi*, *Kosalektawi*, *Hammawi*, *Hewisedawi*, *Atwamsini*, *Achomawi*, *Ilmawi*, *Itsatawi*, and *Madesiwi*), but only the *Madesiwi* and parts of the *Ilmawi* and *Itsatawi* fall within the study area. The Atsugewi, who occupy the southern Pit River territory, consist of two bands: the *Atsuge* and the *Apwaruge*, with the former falling within and the latter located east of the study area.

Traditional Achumawi territory contained great environmental diversity, ranging between 2,000 and 14,000 feet and crosscutting vegetation communities characteristic of both California and the Great Basin. The western areas, which encompass the current study area, provided habitat for salmon and acorns, while steep waterfalls and adverse climatic conditions prevented these important resources from reaching lands to the east. The Achumawi subsistence-settlement system comprised a winter sedentism reliant on stored foods, followed by warm-season occupation of several resource procurement camps. Most winter villages among the western tribelets were located along the Pit River, and consisted of several large semi-subterranean structures, including family dwellings and ceremonial dance houses (also called sweat houses). Family dwellings (measuring roughly 2.5 x 4.0 meters) consisted of shallow excavations covered by a sloping roof of poles and bark. The larger ceremonial structures (about 6 x 9 meters) had a center post and were covered by posts and brush, with a final layer of soil (Kniffen 1928; Kroeber 1925; Olmsted and Stewart 1978).

With the arrival of spring, people set out on foraging trips focusing on several types of greens (clover, thistles), resident fishes (pike, suckers), aquatic invertebrates (mussels, crayfish), root crops (epos, camas), and the spring salmon run west of Fall River. These lowland subsistence pursuits continued into the summer, when people began to move upslope toward foraging opportunities in the mountains. Deer hunting became a common activity, as was the collection of berries and small seeds, and long trips to the Medicine Lake highlands were taken to obtain obsidian (Kniffen 1928; Olmsted and Stewart 1978).

Large and small game hunting appears to have intensified during the fall, including organized drives with the use of fire (Merriam 1926). The most important fall resources in western Achumawi territory were salmon and acorns. High-quality fishing areas were sometimes owned by individual or village groups (Kniffen 1928), and were harvested with a variety of nets (e.g., dip, gill, and seines), bone tipped harpoons, basketry traps, and simple weirs made from poles and brush (Dixon 1905; Kroeber 1925; Olmsted and Stewart 1978).

Upon the death of an individual, the body was wrapped in a hide or net and cremated on the top of a pyre prepared at the regular burning place near the village; the personal belongings were also burned with the body (Voegelin 1942).

The Achumawi and Atsugewi were generally on good terms with their immediate neighbors, sharing "hunting and gathering resources, thus insuring that when a wild crop failed in one area its

inhabitants could always use a neighbor's land where crops were better" (Garth 1978). They were also able to trade commodities during these interactions, as well as larger gatherings when people would get together for festivals. Primary items of exchange included clam disk beads, dentalia, obsidian, a variety of textiles, and other utilitarian objects (Davis 1961).

Occasionally, low-level conflicts would emerge where, for example, a shaman was suspected of poisoning someone in a neighboring village. Of much larger consequence were the regular raids by horse-riding Modoc and Paiute who would capture Achumawi and Atsugewi members and either keep them as slaves or sell them up on the Columbia River where the major slave trading markets were located.

Yana

The Yana occupied the east side of the Sacramento Valley, bordering the Achumawi and Atsugewi to the north, the Konkow to the south, the Maidu to the east, and the Wintu and Nomlaki to the west (see Figure 9). Their western boundary did not quite reach the Sacramento River, as a narrow strip of land east of the river was controlled by the numerically superior Wintu and Nomlaki (Johnson 1978). Yana is a single language divided into three dialects: Northern Yana, Central Yana, and Southern Yana. Southern Yana was spoken in a series of subdialects, each associated with a small mobile band, including Yahi, which was spoken by Ishi (Golla 2011).

Yana territory ranged between 300 and 10,000 feet in elevation and encompassed a wide range of habitat types. The foothills included several varieties of oaks and grasses, while the uplands were covered with a mixed conifer forest. Game animals, mostly deer, were quite plentiful, and salmon entered most of the larger streams, forming an important component of the diet.

Similar to the Pit River peoples to the north, the Yana used a semi-sedentary adaptive strategy, which combined winter sedentism with relative mobility during the warmer times of the year. During winter, when most of the uplands were covered with snow, populations congregated in lowland villages and relied on stored foods. Most of the settlements were located along a narrow strip of land ranging between 1,000 and 2,000 feet, and included semi-subterranean earth covered structures among the Northern and Central Yana, and less substantial conical houses covered with cedar or pine bark in the south among the Southern Yana (Johnson 1978; Sapir and Spier 1943).

Numerous tribelets existed in Yana territory. Each included a major village with a principal chief and large assembly house, surrounded by several smaller allied villages. Tribelets owned particular tracts of land among the Northern Yana, and there was private ownership of certain seed plots and fishing places (Johnson 1978; Gifford and Klimek 1939). Upon the death of an individual, the body was flexed and placed in a deep burial pit with their valuables broken and buried with them. After burial, their house and other possessions were burned. There is no mention of formal cemetery plots, but most accounts indicate that burial occurred near the village (Sapir and Spier 1943).

Although seasonal population movements are not clearly described by Yana ethnographers, discussions of particular resource types provide a rough view of the probable subsistence-settlement strategies that were used. According to Sapir and Spier (1943:249), Yana populations were dependent on "hunting, fishing, and, most important of all, gathering of wild roots, seeds, berries, nuts, and other vegetable products." Beginning in spring, several varieties of roots were harvested, including epos, annis root, camas, tiger lily, and brodiaea.

During the spring and early summer the Yana were given permission to occupy salmon fishing camps along the Sacramento River within Wintu territory (Sapir and Spier 1943). Similar sites must have been occupied in the uplands during summer, because "during the hot summer months after the greens had shriveled and the seeds were spent, few food items were available below 2,500 feet" (Johnson 1978).

Other important summer foods included trout and suckers, numerous insects, sunflower and Clarkia seeds, a variety of berries, and hazelnuts (Johnson 1978; Sapir and Spier 1943).

The acquisition and storage of acorns and salmon was a major undertaking in the fall, although salmon are considered a secondary resource (Johnson 1978:2364). It was customary for men to help knock down acorns in the foothills and then travel to the Sacramento River where they would catch and dry a winter's supply of salmon. Salmon were obtained with spears, harpoons, hook and line, and small seine nets, but the use of weirs is not mentioned. While the men were busy fishing, women would collect the acorns and prepare them for storage. During the remainder of the fall and winter, populations congregated at winter villages, subsisting largely on stored foods (Sapir and Spier 1943).

The Yana tended to be isolated from their neighbors and "were never on good terms with surrounding peoples for any length of time" (Johnson 1978:363). Most conflicts arose from poaching and to avenge the taking of women (Gifford and Klimek 1939), and took the form of small, tribelet- or village-level attacks. Sometimes multi-tribelet alliances occurred, including cases where the Northern Yana were paid by the Atsugewi to help fight the Wintu (Johnson 1978:363).

Inter-group exchange was also minimized by the poor relationships with outsiders, but it did include obsidian and barbed arrows from the north (Shasta and Achumawi), as well as clamshell disk beads, magnesite cylinders, and dentalia from the south and west (Maidu, Nomlaki, and Wintu). These items were exchanged for baskets, buckeye fire drills, deer hides, and salt (Davis 1961; Johnson 1978). The limited nature of these interactions, however, is clearly evidenced by comparing the frequency of beads found in Nomlaki and Wintu sites, where they are plentiful, to sites in Yana territory, where they are found only rarely (see *Prehistoric Context*, page 29).

HISTORICAL CONTEXT (by Sharon Waechter)

The non-native history of the planning area has been a complex continuum of events, trends, technological advances, demographic changes, inter-group contact and conflict, socio-economic development, and environmental alteration. While it can be seen as part of the larger continuum of human occupation in northwestern California, beginning with the first arrivals millennia ago, this latest phase of human history also represented an abrupt and momentous change in all aspects of human lifeways, and environmental alteration in the region and throughout the American West. Perhaps the biggest factor in this change—besides the sheer number of people entering the region—was a fundamental shift in the philosophy of land use. We explore this topic again in a later section of this overview.

This history has been written many times: in diaries, journals, and newspaper accounts by those who witnessed the actual events; in "period" histories by professional historians who were somewhat removed from the events and who often introduced the social and racial biases of their times; and by modern authors, many of whom tend to simply repeat what has already been written, with little or no critical analysis. It is not our intention to write yet another version of this history. Instead, the following narrative is meant as a brief synthesis of those events and developments which (1) had the greatest impact on the social, cultural, environmental, and economic history of northwestern California, and (2) left historical and archaeological remains on the landscape that now fall under BLM jurisdiction and management. While primary research and re-analysis are beyond our scope here, we try to focus as much as possible on key sources, those that present actual historical or archaeological data.

The documents reviewed for this overview draw on a variety of sources. Probably the most reliable of these are official maps and records (USGS topographic maps, County Assessor's Records, company records, census records, etc.), especially those that have been "ground-truthed" through archaeological investigations; histories that are based directly on those records; and the archaeological data itself. Next are the period newspapers and first-person accounts, which are sometimes colored by personal biases and lapses of memory but otherwise provide our best view of particular events. "Official" histories, especially those written in the late nineteenth or early twentieth century, tend to be influenced by contemporary social and cultural attitudes, but these are still valuable secondary sources. Tertiary sources—those that merely quote from or reproduce earlier works—are only marginally useful and are rarely included in this review.

Any attempt to subdivide the non-native history of such a vast and heterogeneous area must be somewhat arbitrary, but some kind of organizational structure is necessary for both research and management purposes. The following narrative is presented largely by period, emphasizing the major historical events and developments in each region, particularly those that left archaeological remains on the landscape. Certain topics—particularly the Gold Rush and its aftermath—are applicable to all regions to one degree or another, and others (for instance, the Extraction Economy) span essentially the entire historic period. For this reason, we have not assigned specific date ranges to the various topics.

"DISCOVERY": EARLY SPANISH AND ENGLISH MARINERS

It was along the coast that the non-native history of California began, first with sporadic visits by Spanish and English mariners and then by explorers and fur trappers from Spain, Russia, England, and the United States. Unfortunately, there is little evidence of these activities in the surviving archaeological record of the region.

The search for a northern sea route between the Old World and the New, and for safe harbors along the way, became a primary objective for Spain and England within half a century after the

European "discovery" of North America. For some 250 years, mariners from both nations traveled along the coast, apparently without ever making landfall in Mendocino, Humboldt, or Del Norte County. Finally, in 1775, Spanish sailors under the command of Lieutenant Bruno de Heceta and Juan Ferdinand de Bodega y Quadra came ashore at Trinidad Head on Cape Mendocino.[3] The day was Trinity Sunday, and the Spaniards named the bay accordingly.[4]

Nixon (1966:162) states that Trinidad Bay and Cape Mendocino soon became a stopping point for Manila galleons sailing between Manila and Acapulco. Paterson et al. (1978:6) say that British sea captain George Vancouver visited the bay in 1793 but "formed a low opinion of the supposed harbor, the only one then known on the north coast."[5] According to Hotchkiss (1957), he referred to it as a "nook."

Although there are several other accounts of explorations along the far northern California coast, the dearth of detailed records for this period suggests that these early visitors did not venture far from shore or have prolonged encounters with the local native populations. The earliest such encounters north of Sonoma seem to have been in the Fort Ross area to the south of our study region, between the Russians and the Pomo people among whom they settled (e.g., Lightfoot 2005). Consequently there are no documented archaeological resources from this time period within the planning area.

COMING INTO THE COUNTRY: EARLY EXPLORATION AND COLONIZATION

The early decades of the nineteenth century were a period of multi-national exploration of the American West, triggered in part by the Lewis and Clark expedition and by the competing interests of certain European powers. The first tentative explorations of the planning area were driven, like so much of human endeavor, by economics: what kinds of natural resources would be found there, and who would be the first to get rich by exploiting them? Enter the fur trading companies and explorers.

Trappers and Explorers

The histories of the North West Company, the Russian-American Company, and the Hudson's Bay Company in northern California are well known. Leader (1928) gives an almost painfully detailed description of the early fur companies in California and Oregon, noting that, despite Spanish regulations, "American merchants were [already] trafficking for sea otter skins along the coast of California" by the late eighteenth century (1928:38). They came by land and by sea. Many overland parties entered from British territory to the north, others from American lands to the east. Some of the earliest were led by now-famous explorers like Peter Skein Ogden (1825-ca. 1830), Jedediah Strong Smith (1826–1828), John Work (1832–1833), and James Douglas (1840). All of these men left journals of their travels, now available on-line (for example, transcripts of Smith's journals can be found at (http://www.mtmen.org/mtman/html/jsmith/index.html). The journals are perhaps most valuable for their first-hand accounts of encounters with Native groups whose traditional lifeways had not yet been completely disrupted. The entries suggest that local tribes were variously curious, hostile, or afraid of the outsiders.

The Northern California Coast

Within two years of Lewis and Clark's famed explorations, fur trading companies were landing at Humboldt Bay. In an atlas and explanatory volume compiled by a Russian named Tebenkof in 1848,

[3] Some authors have argued for a much earlier discovery of the Humboldt Coast by British mariner Francis Drake. Paterson et al. (1978:5) name Bodega as the discoverer of Trinidad Bay; they do not mention Heceta at all.

[4] Diary excerpts from Heceta and several other early mariners are recounted at length by Heizer and Mills (1952).

[5] Paterson et al. (1978) draws heavily from official maps and records, and is considered here to be a reliable source of "first-hand" information on the histories of Humboldt, Mendocino, and western Trinity Counties.

credit for the "discovery" of Humboldt Bay is given to Captain Johnathan Winship, "an American, in an American vessel, with an American crew—but all…temporarily in the service of the Russian American Company" (Irvine 1915:26).[6] Historian and geographer George Davidson, reading the same atlas, cites part of the text: "[a]ccording to the Colonial Documents of the Russian American Company, it appears that [the bay] was discovered by citizens of the United States. In 1806 there was in it (an American vessel) under the command of (Jonathan) Winship" and a party of Aleut sea otter hunters (Hotchkiss 1957:31).[7] Within a decade, the fur trappers had greatly diminished the sea otter population on the coast, and the Russian-American Company withdrew, leaving the region to the British and American trappers. While it is not mentioned in most histories, the loss of sea otters also must have deprived the region's Native populations of an important source of food and pelts.

Paterson et al. (1978:6–7), citing Coy (1929), provide the following information on early Native/non-native encounters during this period:

> In 1803 the American ship *Lelia Byrd* under the command of Captain William Shaler arrived at Trinidad Bay after a voyage from Canton…The ship and the work parties attracted the attention of the local Indians[,] who came to observe the proceedings in a civil manner. As more and more Indians arrived, however, the tone of the gathering became more ominous…No violence erupted despite the tense situation and the *Lelia Byrd* sailed away to the south.

Hotchkiss (1957:29) describes this "tense situation" in a bit more detail:

> Trade was started with the Indians[,] who at first appeared to be quite civil, but as their numbers increased, they became more troublesome. Distribution of presents restored some harmony, but as they were gradually augmented by reinforcements from neighboring tribes, the situation became so critical that all the work on repairs had to be done under the protection of the guns.

We know that trapper and explorer Jedediah Smith also visited the North Coast during his travels in northern California: on May 6, 1826, he wrote that he had encountered "the noblest trees I had ever seen[,] being 12 or 15 feet in diameter[,] tall straight & handsome." Smith also noted that the party had killed several elk, and that they camped that night in sight of the ocean. These explorers may have been the first American citizens to stand among the giant coastal redwoods of northwestern California.

The Northern Interior

The standard wisdom is that the overland parties of trappers and explorers who traveled into northern California in the 1820s and 1830s were the first non-native people to visit the interior of the state. Both Peter Ogden and Jedediah Smith traveled through the upper Sacramento Valley and into the Trinity country in the 1820s. In February 1827, Ogden reportedly camped among the "Sastise" or Shasta (Leader 1928:14–15).

Smith describes his travels along what he called the "Buenaventura River," trapping beaver and hunting elk along the way. He and his party were almost certainly traveling along the Sacramento River: in his journal entry of December 26, he reports that "It was the instruction of the Genl to Don Lewis that I should cross the Buenaventura River near its entrance into the Bay of St. Francisco." The party traveled up the river in rainy weather, crossing muddy "Slous" and encountering several "indian villages" and

[6] Irvine provides a lengthy and detailed discussion of early exploration along the coast, with many anecdotes (but few references).

[7] This apparently was the last recorded vessel to enter Humboldt Bay until 1850. The bay was "rediscovered" from inland by the Gregg-Wood Party in December of 1849.

"dirt lodges." In April and May 1828, Smith and his party ventured through southern Trinity County near Hyampom. By that time Smith had exchanged the fur trade for the horse trade, driving some 300 horses up the Sacramento Valley and west through a low gap in the coast ranges west of Red Bluff: "His route probably followed Hayfork Creek from the present location of Wildwood to the South Fork of the Trinity River to the Klamath River" (Paterson et al. 1978:8).

Leader (1928) describes John Work's party of trappers in the Feather, and possibly Yuba, River areas. (Although several of Work's journals are available on-line, his account of the expedition into the Sacramento Valley is not one of them.) There were so few non-native settlements in the region at that time (1832–1833) that some of the trappers had to go all the way to Colony Ross on the Sonoma coast to buy ammunition. Northern California was still a wide-open frontier—if you conveniently overlooked the fact that Indian people inhabited every part of it, and had done so for millennia.

The Rush for Territory

By the time the first white explorers entered the study region, the southwestern part of "Alta California" had already been under Spanish rule for several decades, as part of an expansionist plan "for missionaries to establish missions and civilize the Indians, but also for soldiers to found frontier outposts and settlers to start farming communities" (Robinson 1948:33). This grand plan was foiled by Mexican independence in 1821. By the time Ogden entered the north state in 1825, California was part of the newly independent "empire" of Mexico, whose colonial government was understandably hostile toward the British, Russian, and American incursions. Smith's journal entries describe the "welcome" he received from missionaries at Mission San José ("St. Joseph"):

> They did not appear disposed to hear me, and told me I could go no further and soon showed me the way to the guard house. My horses were [taken] away and for two days I could get no satisfaction whatever. They would neither put me in close confinement nor set me at liberty. No provision whatever was made for my subsistence…
>
> …Finally Lieut. Martinos came up from St. Francisco. After a little conversation with him I found I was to be tried for an intruder…[Smith's Journal of His Second Expedition to California, 13 Jul 1827 – 3 Jul 1828].

The lack of hospitality was not limited to the Spanish and Mexican authorities, either. According to the journals of John Work, the Russians at Colony Ross would not sell him as much ammunition as he requested, and they charged him "high prices for an inadequate supply of powder, lead, and tobacco" (Leader 1928:97). They also warned him that there were "no beaver in the few small rivers" along the coast, in order to "discourage any encroachment on their preserves." For his part, Johann Sutter wrote to the Hudson's Bay Company at Fort Vancouver, forbidding them to send trappers into his "Tularies." Apparently his letter was ignored (Leader 1928:102). The European settlers and Mexican authorities were right to be worried: by the early 1840s the first emigrant wagons were rolling into northern California via the Siskiyou, Yreka, Nobles, Applegate/Lassen, and other trails.[8] The race for territory was on.

Mexican Land Grants

Agriculture began in this region even before the Gold Rush, with the Mexican land grants awarded to a number of early settlers. The young Mexican government began accepting private applications for grants of land under the jurisdiction of the pueblos and presidios. While the majority of these grants were made in central and southern California, in 1844 and 1845, Governors Manuel

[8] Rose et al. (2010), Sullivan et al. (2005), Tveskov et al. (2001), and Wilson (1998) provide archaeological information on some of these trails.

Micheltorena and Pio Pico granted nearly 300,000 acres in Shasta, Tehama, Butte, and Colusa Counties alone to American or Euro-American settlers (http://www.sos.ca.gov/archives/collections/ussg/index-us-surveyor-general-maps/). Many of these, the northern-most Mexican grants in California, clustered along both banks of the upper Sacramento River (Smith 1997:7–10). The northernmost of all California ranchos was *Rancho de Buenaventura* (sometimes written as *Buena Ventura*), a three-mile-wide swath of land stretching for 19 miles along the west side of the Sacramento River from Cottonwood Creek northward beyond what is now the city of Redding, granted to P. B Reading in 1844 (further evidence that Smith's "Buenaventura" river was actually the Sacramento). These ranchos were typically made up of the most fertile and desirable lands. Maps (*diseños*) are available for many of these grants, including Buenaventura, but they lack detail and are not to scale, so they are of limited value for historical or archaeological study.

A recent study by Greg White (2015) of John Bidwell's *Rancho Chico* provides a wealth of photographs and primary information on another of the northern California ranchos. White summarizes the development and layout of the rancho headquarters, and the archaeological evidence that has been uncovered there over the years. He also describes Bidwell's relationships with the native Konkow people, including his use of Indian labor on the rancho (and the fact that "Indian attacks" burned his operation to the ground in 1851). Other studies have also provided information on the early ranchos: Treganza (1957) performed test excavations and architectural details on Ide's Adobe near Red Bluff and, more recently, Shasta College has been excavating in Vina, searching for Peter Lassen's second adobe.

Summary

As with the previous period, the events of the first half of the nineteenth century in northwestern California left little in the way of archaeological remains. In general, the 1830s and early 1840s was a time when "Yankees in California still remained but a small handful…a tightly-knit community of traders and seafarers, despite their wide dispersal up and down the coast" (Hawgood 1958:27). The early trappers were followed in the 1840s by settlers encouraged to emigrate to the far west in response to federal land policies, such as the Preemption Act of1841, which encouraged the transfer of lands from the public to the private domain (Moratto et al. 1994). During this period the US became interested in annexation of California and sent "scientific expeditions" to the Pacific Coast, beginning in 1841 with US Navy Lt. Charles Wilkes (Martin et al. 1981:12). Even so, until 1846 Alta California remained primarily a Mexican territory, and most of the population was of Mexican, Spanish, or Native American ancestry.

THE WORLD RUSHES IN: THE GOLD RUSH AND WESTERN EXPANSION

This period was, without a doubt, the defining era in the history of northwestern California. Growing tensions between the Mexicans, Russians, British, and Americans over ownership of Alta California (and events in Texas) led ultimately to the US declaring war on Mexico in May 1846. The war lasted less than two years, and in 1848 Mexico ceded more than half a million square miles of western territory to the United States. While this added significantly to the size of the US, it was overshadowed by another event that would affect not only California but the entire country: the discovery of gold. The events that took place after that discovery would truncate the development of Native society, throw multiple ethnic and racial groups together in one relatively small area, and unleashed a storm of economic rivalries and environmental changes that would affect California up to the present-day.

In other words, the Gold Rush was about much more than just mining. It changed every aspect of northern California: the social, cultural, and ethnic makeup; philosophies of land use and ownership; hydrology and vegetation patterns; governmental legislation; even the physical landscape itself. To investigate "Mining" as a theme unto itself is to over-simplify this complex web of relationships and interactions. As Selverston et al. (2005:147) found in their study of mining in the Oroville district, "The

sites do not fit into tidy thematic packets, as many of them represent more than one theme." They go on to say that "[m]any of the resources discovered are strongly related to more than one expected historical theme, creating a mosaic of interrelated parts of a complex past" (2005:191). In this overview we attempt to present historic mining as part of that mosaic: we consider the discovery of gold as an impetus for western expansion, mining as part of the Euro-American economic mindset of resource extraction, and the major demographic and technological changes that gold mining brought to the north state.

The Discoveries

Every school child in California learns that gold was discovered at Johann Sutter's sawmill on the American River in Coloma, El Dorado County, in 1848, and that the central Sierra Nevada foothills held the "Mother Lode" of gold-bearing quartz veins. (There were earlier discoveries in southern California by the Spanish, and no doubt Native Americans were aware of its presence). But this was only the first of many such discoveries, and only one of several gold-rich areas. Clark (1970:Figure 2) provides a coarse-grained map of the two largest and richest gold-bearing regions of California: the "Sierra Nevada Province," including a wide swath of foothills and lower mountains from Plumas and Butte Counties on the north to Fresno County on the south; and what he calls the "Klamath River Province," taking in all of northern Del Norte, western Siskiyou, northeastern Trinity, and far western Shasta Counties. It is easy to recognize where gold mining had the biggest impact, and why, when we look at a more-detailed adaptation of Clark's map (Figure 14). Eastern Butte County, for instance, lies at the northwestern-most tip of the Sierra Nevada province, and—not coincidentally—the Oroville District produced more gold ($55 million) than any other single mining district in the planning area (Clark 1970:Table 6). Even more impressive, however, was the Klamath Mountains geomorphic province. Smith (1995:1) tells us, for example, that the Trinity region was "[t]he second highest gold producing area of California." It was the placer deposits along the Trinity and Klamath River drainages that produced the most gold overall. It has been estimated that (as of 1970) $35 million worth of gold had been mined from the Trinity River placers alone (Clark 1970).

"Ho! For the Trinity!"[9]

Trinity and neighboring areas of Shasta and Tehama Counties saw some of the earliest gold mining activity outside the Mother Lode region; Beason and Wee (in Byrd et al. 2008) provide an excellent summary of this activity. In their study of the Horsetown Mining Complex, Vaughan and Ritter (1992) relate the well-known story of how fur trapper and explorer-turned Army paymaster Pearson B. Reading and his Indian laborers discovered gold at what would become Readings Bar on Clear Creek, near Douglas City, in July 1848. Petersen (1965:22; cited in Vaughan and Ritter 1992) says that the Clear Creek district became the most important gold mining district in Shasta County, bringing would-be miners over the Lassen Trail to the Clear Creek Diggings (later One Horse Town and then Horsetown). "On an 1851 map of California, Shasta and One Horse Town were the only towns [depicted] in northern California" at that time (Vaughan and Ritter 1992:7). Before long, however, the region would be overrun by placer miners, forcing the Native peoples to abandon their villages along the creeks and rivers.

Forks of the Feather River

In the Sierra Nevada foothills of Butte County, the first gold panning on the Feather River took place just months after the "discovery of gold by Euroamericans on the American River" (Selverston et al. 2011:3-2, 3-10), when early settler and rancho owner John Bidwell found placer gold on a bend of the river in March 1848. He made a second discovery farther upriver, at what would become the town of

[9] *Alta California* newspaper, April 10, 1850.

Figure 14. Mining Districts (after Clark 1970).

Bidwell Bar (now inundated by Lake Oroville). Soon the area was swarming with miners, as nearly 2,000 of them moved in: "wherever the eye wandered on the slopes and ravines close to the edge of the river, tents were pitched" (Gerstaecker 1946:162, cited in Selverston et al. 2011:3-10). Many of these newcomers arrived from Oregon Territory, as reflected in the names of several mining areas on the Feather River: Oregon Gulch, Oregon Gulch Creek, Oregon Bar. The first several years of the Gold Rush in this area "experienced sustained and intensive placer gold mining made possible by a large and diverse influx of miners into the state, and rapid advances in simple placer technology" (Selverston et al. 2011:3-9). We summarize those technological developments later in this overview.

On The North Coast

The discovery of gold had a more indirect effect on the coastal region. Although there was a short-lived "rush" at Gold Bluffs, where gold existed in the sands on the beach, no one was ever able to find a practical, cost-effective way to separate it out. Instead, the mining "pay dirt" for early Coast Range towns like Trinidad, Union (now Arcata), and Eureka were as entry points and supply centers for the Trinity and Klamath River mines (Paterson et al. 1978). By 1852 Union/Arcata led the trade, bringing in more than half a million dollars in 1855 alone.

Reading's naming of the Trinity River, on the mistaken belief (based on early Spanish navigation charts) that it flowed into Trinidad Bay on the north coast, led to a search for a coastal route to the river. In 1848, the first ships began to arrive in Humboldt and Trinidad Bays in nearly half a century: Bailey (2008:13) reports that, because of the rugged terrain bordering Shasta County to the east, "most of the miners arrived at the isolated Trinity River gold fields from San Francisco via Trinidad Bay and Eureka." This opened up pack trails that ran overland to the mouth of the Trinity River and then up the Klamath, over the Bald Hills, or directly east to Weaverville. These trails also carried supplies from the ships to the mines. For a time, steamboats traveled from San Francisco Bay up the Sacramento River, mainly as far as Red Bluf but on several occasions as far as the vicinity of Redding, giving miners and their suppliers another way of accessing the rugged mountains region.

In The Klamath/Siskiyou Mountains

Once it was discovered that it was the Klamath River, not the Trinity, that flowed to the ocean, many miners followed it into the interior—despite the opinion of at least one early individual that "[t]he treacherousness of the entrance to the river, owing to the shifting channel at its mouth…finally forced conviction on the most sanguine that the Klamath River was not a practicable line of communication with the mines of the interior" (Van Dyke 1891). Undoubtedly the many Native tribes along the river were even less pleased to see it used as a travel route for the would-be miners.

The first mining in the Klamath River region reportedly was conducted by Lindsay Applegate, who traveled south from Jacksonville, Oregon, in 1849 to mine along Beaver Creek and the Klamath and Scott Rivers (Wells 1881:53). By June of the following year, prospectors from the Trinity River had crossed the Salmon-Trinity Alps and found gold in the Klamath/Siskiyou region. Within a year, the "northern mines" were drawing prospectors from all corners of the earth. Without roads, they traveled by foot or mule train, staying for only a short time in any one place (Fiorini-Jenner and Hall 2002:8). The Klamath River Gold Rush came principally in 1852, however, when 500 to 1,000 miners were working near its junction with the Salmon River. Three of the first mining camps in the area were Cottage Grove, Cottonwood (Henley), and Happy Camp; only the latter still exists as a settlement (Waechter and Marvin 2011).

Although some placer mining took place along the Scott and Shasta Rivers, the mountainous region of the Upper Klamath River did not see the kind of large-scale mining boom that would transform areas like the Trinity basin or the Sierran foothills. Beckham (2006:4) says that "[t]he Upper Klamath River Canyon

yielded no useful mineral deposits," and that placer mining on the Klamath did not extend above the mouth of the Shasta River. Most of the miners eventually departed for other regions after the easily accessible gold was depleted, while others died penniless and destitute. A few settled in the valleys, meadows, and along the edges of the rivers, some to ranch and others to log the vast stands of timber in the steep riverine canyons.

Summary

More than any other historic-era activity, mining left its mark on the landscape as archaeological sites and features: prospect pits, ditches and flumes, adits, shafts, placer tailings, dredger tailing fields, hydraulicked hillsides, miners' camps, and settlements. Many mining camps and supply centers evolved into permanent settlements. Of the recorded historic-era components in the Planning Area, nearly 40% can be directly linked to mining; if we omit the indeterminate components, the total rises to 52% (see ahead to Table 20, page 204). No doubt this is due to the sheer scale of mining in northern California, the conspicuousness of the archaeological remains left by mining, and the enduring nature of these remains. Sometimes less obvious, but no less significant, are the social and economic effects mining has had on the development of the state. We return to this topic in a later section.

PUBLIC DOMAIN: THE HOMESTEADING ERA

The discovery of gold in several areas of northern California brought the region keenly to the attention of the US government. In November 1848, President James K. Polk "pronounced that economic opportunity in California would allow the US to compete with Great Britain, the dominant global power" of the time (Selverston et al. 2011:3-9). After California was granted statehood in 1850, many in the US government began to push for the opening of western lands to independent farmers. Southern politicians, however, feared that western farmers would compete with southern plantations for the agricultural market, and would lead to the creation of more anti-slavery states. It was not until the South ceded from the Union at the start of the Civil War that Congress was able to pass the first Homestead Act, in 1862. Ultimately there would be nearly 10.5 million acres of Homestead Act lands granted in California alone (https://www.nps.gov/home/learn/historyculture/statenumbers.htm).

The Homestead Act Opens the West

Although there were certainly thousands of acres under cultivation and livestock grazing in the planning area before that time, the Homestead Act created the next big influx of settlers to California. It offered "unoccupied" land to any US citizen who was willing to settle on the land and farm it for at least five years. With this opening of public lands to private ownership came the need for cadastral surveys to identify property boundaries; enter the General Land Office, first established in 1812 and now of critical importance in the implementation of the Homestead Act (Crazier n.d.; White 1982).

Not all of the claims were legitimate, though: it was common practice for eligible children of large families to file separate (but adjacent) claims, locking up large areas of land; mining and lumber companies sometimes did the same. Some, though certainly not all, of the large family landholdings in California today originated from these fraudulent practices.

Another impetus for the growing number of farmers and ranchers in 1860s California was the fact that they could sell much of their production to mining camps, for up to 10 times the pre-boom rates. Sheep and cattle production in many areas doubled during this period, to meet the miners' increasing desire for fresh meat and dairy products (e.g., Moratto et al. 1994). The extensive networks of mining ditches built in the 1850s–1860s also provided irrigation water for the early farmers and ranchers in and near the mining regions, further encouraging settlement there.

The Birth of California Agriculture

While agriculture in California actually began in the late eighteenth century with the Franciscan missions, it was the US government's forced relocation of Native people from their ancestral territories in northwestern California that opened that region to large-scale agriculture. In the North Coast Ranges, the 1860s saw the expansion of small farms and dairies into the fertile valleys and prairie lands of Humboldt and Mendocino Counties, especially along the Eel, Bear, and Mattole Rivers. Maniery and Millett (2008:6) also mention settlers along the Smith River in Del Norte County who "planted fruits, raised cattle, sheep, and chickens, sold butter, and lived a self-sufficient life." Paterson et al. (1978:16) describe an expansion outward from the "coastal enclaves" like Humboldt Bay and the heavily cultivated regions of southern Mendocino and northern Sonoma Counties, into more hinterland areas.

But stock raising was the main agricultural activity for much of Humboldt and Mendocino Counties, as cattle and sheep ranchers expanded into the upland prairies and mountains east of the redwood belt. In the nineteenth century, ranchers had essentially free and unregulated access to grazing lands. Although small family farms and dairies were the norm in the early years, a few large ranching operations were established, notably George White's vast holdings in Mendocino County, Townsend and Cary's Eden Valley Ranch south of Covelo, and the 250,000-acre Russ family dairy and stock ranches in Humboldt County.[10] Ranching also stimulated other, related businesses like tanneries, creameries, and woolen mills.

The "opening" of the west was slower in some areas than in others. In the Klamath and Siskiyou mountains, the first homesteaders lived largely off the local wildlife—black-tail and mule deer, rabbits, salmon and trout. Gradually they established small farms in Butte, Shasta, Pleasant, and other valleys, and on benches along the rivers, but the lack of good roads or other means of transport largely cut them off from outside markets. The rugged landscape and lack of developed transportation systems kept the agricultural industry small and local, with subsistence crops like grains, potatoes, and livestock the primary commodities. Small orchards sprang up as well.[11] Without good roads, however, produce could not be transported very far. Cattle (and to a lesser degree, sheep) became a primary agricultural product, for the simple fact that they could literally walk themselves to market (Beckham 2006:83).

In the upper Sacramento Valley, farming and ranching were already well established by the Homesteading era: the 300,000 acres of rancho lands in Butte, Tehama, and Shasta Counties had been under cultivation and grazing for nearly two decades. For example, White (2015:15) notes that John Bidwell had "shift[ed] his focus to agriculture and merchandise to provision the growing immigrant population of California" during the Gold Rush, and that by 1857, Bidwell "had 350 acres under cultivation, supporting a diverse array of tree and row crops (The California Farmer 1857). His ranching and farming enterprises grew and diversified steadily through 1868." The lands along the Sacramento River comprised some of the most fertile ground in the world, and by the late nineteenth century had been planted in fruit and nut orchards, grape vines, and fields of strawberries.[12] Several small agricultural communities sprang up along the river, including the Saron Fruit Colony (formerly Jelly's Farm) and the Bend Colony. Today the valley remains one of the prime agricultural regions in the world.

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[10] Paterson et al. (1978:44) cite the S. B. Fountain Papers (n.d.) as listing the Russ holdings at 50,000 acres; Irvine (1915:471) lists them at 250,000 acres. The Fountain Papers may be referring to an earlier period and/or only a part of the vast Russ family enterprise.

[11] Remnants of some of these early orchards can still be seen; see, for example, BLM (2006).

[12] Additional information on regional agriculture can be found in Smith (1997), who provides a discussion of historic-era livestock ranching in western Tehama County, and in Bevill and Nilsson (2001), who summarize the agricultural history of western Shasta County.

The Environmental Effects of Agriculture

Eventually farming and ranching (particularly overgrazing) would contribute to dramatic changes in grassland plant species in many areas (e.g., Keter 1989, 1990), and the fenced-range system increasingly cut off the Native inhabitants from their traditional hunting and gathering grounds. As with mining and logging, the scale of environmental change brought on by Euro-American agriculture in northern California was immeasurable. Within a few generations, native plants were largely replaced by grains, orchards, and row crops—even by introduced weed species such as star thistle, Russian thistle, and "wild" oat. Plowing of open prairie lands and clearing of trees for farming left only remnants of native grasslands and gallery forests.

Grazing took its toll as well: in his *Early California Reminiscences*, John Bidwell (cited in White 2015:14) wrote that it was "not easy to conceive and understand the change in the condition of the country caused by the extensive pasture of horses and cattle on these [upper Sacramento Valley] plains." Even greater changes were to follow, however, with the development of large-scale water management systems in the early twentieth century (see ahead to *Transportation and Water Development*, page 148). By the early twentieth century, federal land management agencies would begin to regulate grazing and other activities on public lands, but by that time much environmental damage had already been done.

NATIVE RESISTANCE AND THE INDIAN WARS

The Homestead Act and the resulting flood of settlers to northwestern California worsened an already grim reality for the Indian peoples living here. Almost as soon as the first explorers had entered the region, tensions arose between them and the Native populations. There is little information on these early encounters from the Native point of view (one exception being Norton 1979, cited by Keter [1990]), but it is clear from the diaries of some traders and explorers, cited above under that heading, that they considered the "Indians" to be troublesome, at best. As is typical when two such disparate cultures meet (and vie for the same territory), curiosity developed into suspicion, suspicion into animosity, and animosity into violence.

The period between 1853 and 1865 was particularly violent: "The massacres and upheaval of the 1850s are referred to by many Indian people as the Holocaust (Tushingham 2013:25). Multiple massacres of Native people took place across northwestern California, including the 1859–1860 "Mendocino War" that resulted in the deaths of hundreds of Yuki and other Indian people in the Round Valley vicinity (Baumgardner 2006; Carranco and Beard 1981); the 1860 massacre of nearly an entire Wyot village on Tuluwat (Gunther) Island in Humboldt Bay (Tiley and Tushingham 2011); the near-annihilation of almost the entire Sinkyone tribe at Needle Rock on the Mendocino Coast (Margolin 1981); and equally tragic events at Burnt Ranch on the Trinity River, Bloody Island in Clear Lake, and countless other locations. In the words of one California author:

> Supported by a community fearful of the "Indian menace" and greedy for Indian land, legitimized by newspapers that extolled the "manifest destiny" of the white race, groups of men throughout northwestern California formed "volunteer armies" that swooped down upon Indian villages, killing men, women and children indiscriminately. After such raids the men—often a ragtag troupe of unemployed miners—would present expense vouchers to the state and federal governments for actions against "hostile Indians." In 1851 and 1852 California authorized over $1 million for such excursions. It was nothing short of subsidized murder [Margolin 1981:165–166].

As Adkins notes, the "core of the conflicts" was the fact that the two cultures "held a wholly different approach to resource use" (2007:72): [w]arfare, a severe reduction in population, and confinement to reservations removed the Indians as an obstacle to the process of Euro-American settlement. The way

was opened for the unbridled development of the resources of northwestern California…" Miners and loggers were indifferent to the erosion and subsequent siltation of fishing streams, settlers and ranchers felt that they "owned" the land that had formerly been open to all, and increasingly fenced Native people off from their traditional hunting, fishing, and gathering grounds. Retaliations by Native people raised panic among whites, who lobbied for protection from the military. As a result, no fewer than 13 US military forts were established in northwestern California between 1850 and 1865 (Table 2). The first three forts were established in the interior (Siskiyou, Shasta, and Tehama Counties), with the rest in the North Coast Ranges and Klamath Mountains. The US Army and (during the Civil War) the California Volunteers, often assisted by local ranchers and settlers, "launched incessant attacks from these camps, driving Indians from their exposed villages and forcing them to take refuge higher in the mountains" (Wee 1980:50).

Table 2. Military Forts in the Planning Area.

NAME	REGION (LOCATION)	DATES
Fort Jones	Upper Klamath (Central Siskiyou County)	1850–1858
Fort Reading	Upper Sacramento Valley (Anderson)	1852–1867
Fort Vose	Upper Sacramento Valley (Nome Lackee Indian Reservation, Tehama County)	1855–1858
Fort Ter Waw	North Coast Ranges (Del Norte County)	1857–1862
Fort Gaston	Klamath Mountains/High North Coast Ranges (Hoopa Valley Indian Reservation)	1858–1892
Fort Seward	Klamath Mountains/High North Coast Ranges (Eel River)	1861–1862
Fort Baker	North Coast Ranges/Klamath Mountains (Humboldt County)	1862–1865
Fort Wright	Klamath Mountains/High North Coast Ranges (Round Valley)	1862–1866
Fort Anderson	North Coast Ranges (Redwood Creek)	1862–1866
Camp Lincoln	North Coast Ranges (Del Norte County)	1862–1869
Camp Grant	North Coast Ranges (Weott)	1863–1865
Fort Iaqua	North Coast Ranges (Humboldt County)	1863–1866
Fort Humboldt	North Coast Ranges (Eureka)	1863–1867

Keter (1990:2) provides an example of this forced exodus, during what he calls the Refuge Period in the North Fork Eel River Basin, from 1854 to 1864—a period when "nearly the entire aboriginal population of the region either died of disease [or] were killed, sold into indentured servitude, or removed to reservations." Unique among scholarly works about this era, Keter's study also looks at the "relatively rapid, irreversible, and significant changes to the environment" that have occurred since (and in large part because of) the land-use practices and attitudes of the Euro-Americans who occupied the area—in particular the ways that livestock overgrazing depleted the native perennial bunchgrasses and forbs and caused general deterioration of the native vegetation (1990:16–21).

Another very interesting aspect of Keter's study is his discussion of the archaeological signature of refuge sites. This topic has been explored in other regions as well, including the North Coast Ranges (Tamez 1981), the American Southwest (LeBlanc 1999), and northeastern California (Waechter 2002). LeBlanc's "social conflict" model states that sudden, major shifts in settlement, especially from open and easily accessible habitats to remote or hidden places with more difficult access, likely reflects mounting inter-group hostilities. Waechter (2002:62) explains that, "[d]uring periods of population/resource imbalance, social and ethnic conflicts are almost inevitable—particularly when the imbalance is caused by an influx of new people into an already occupied area." The archaeological signatures of refuge can include habitation sites in remote and inaccessible locations, unusually large caches of weaponry, and living areas that are obscured behind screens of rock and/or vegetation and invisible from a distance (but with a good outward line of sight). Where such sites include historic-era artifacts, including obsidian with hydration readings of

less than 1.0 micron, it is entirely possible that they were occupied by Native people escaping the US Army, volunteer militia, or hostile settlers (see above under *Prehistoric and Ethnohistoric Archaeology Contact Period*).

While there were murders and other atrocities on both sides, it is clear from the diaries, letters, and histories written by Euro-Americans that many of them considered the Native people to be less than fully human. This attitude persisted for two hundred years, partly as a rationalization, no doubt, for the annihilation of thousands of Native people and the theft of their lands. The bigotry is clear, even in so-called scholarly writings, in such phrases as "the prowling and treacherous Indians" and "savages" (Bledsoe 1881:8–9). As recently as 1957, Hotchkiss wrote about "tribes of the most primitive types of Indians whose menacing tactics plagued the white man from the earliest time of discovery" (1957:6). Little wonder that many Native people today still feel animosity toward Euro-Americans.

THE EXTRACTION ECONOMY

In the second half of the nineteenth century, the "wholly different approach to resource use" (Adkins 2007:72) that characterized European and Euro-American activities in California would change not only the economic landscape but the physical one as well. At the risk of resurrecting the myth of the "noble savage," it is fair to say that Native peoples tended to view the land and its resources as things to be used but also respected and left unspoiled. Non-natives, on the other hand, came from a very different tradition. Adkins (2007:12) expresses it this way: "The Euro-American world view held that the natural resources in the region were commodities available for exploitation within a free market system. By the 1850s, this non-indigenous world view had reached every corner of California and the West." For our study region, these "commodities" were primarily gold and other minerals, timber, agricultural land, and—necessary to all—water.

Gold and Copper Mining

Since gold was the first commodity to see large-scale extraction in northwestern California, let us begin there. We have already described the various discoveries across the region in 1848–1849, and the subsequent tidal wave of immigration. What followed this initial period of discovery were demographic, environmental, and technological transformations on an unprecedented scale.

Changing Demographics

Beginning in 1848, the relatively small population of mostly Native Americans, Mexican nationals, and a few Europeans and Euro-Americans in northern California was besieged by gold seekers and adventurers. Native people who had managed to survive the original onslaught of foreigners now faced overwhelming odds, and—ironically—rancho owners like Johann Sutter and John Bidwell found themselves having to defend their property rights against squatters. The demographics of California transformed virtually overnight.

Census records for the Gold Rush period in the planning area are, unfortunately, limited and incomplete (Table 3). Only four of the counties in the planning area had been established by the time of the 1850 federal census, and even in those four counties, the numbers almost certainly do not include Native Americans or Asians. The data are useful, then, only in revealing the dramatic increase in European and Euro-American population during the first two full decades after the gold discovery. From 1850 to 1860, the four counties for which we have census data increased in non-native population by at least 68%; in Mendocino County it was nearly 100%.

Table 3. US Census Data, 1850–1870.

County	Incorporation Date	June 1, 1850	June 1, 1860	10-Year Increase	June 1, 1870	10-Year Increase
Butte	1850	3,574	12,106	70.5%	11,403	-5.8%
Mendocino [a]	1850	55	3,967	98.6%	7,545	90.2%
Shasta [a]	1850	378	4,360	91.3%	4,173	-4.3%
Trinity	1850	1,635	5,125	68.1%	3,213	-37.3%
Klamath	1851 (abolished 1875)	n/a	1,803	-	1,686	-6.5%
Siskiyou [a]	1852	n/a	7,629	-	6,848	-10.2%
Humboldt	1853	n/a	2,694	-	6,140	128.0%
Tehama	1856	n/a	4,044	-	3,587	-11.3%
Del Norte	1857	n/a	1,993	-	2,022	1.4%
County Totals	-	5,642	43,721	87.1%	46,617	6.6%
State of California	1850	92,597	379,994	75.6%	560,247	47.4%

Notes: Census data from this period generally do not include Native Americans or Asians (Chinese). [a] Portions of these counties are outside the Planning Area, including a large part of Mendocino County.

Surprisingly, the following decade (1860–1870) saw a *decrease* in population in six of the nine counties. While the populations of the Coast Range counties continued to increase, every other region experienced a loss in European/Euro-American inhabitants—most notably Trinity County, which lost more than a third of its white population. The six counties with a loss in population are also the ones that were most directly and intensively impacted by the Gold Rush. This suggests that the census data reflect the large numbers of would-be miners who failed to strike it rich and moved on to "greener pastures" (sometimes literally) in places like Humboldt and Mendocino Counties.

County census records provide lists of individuals by name and place of birth. The 1850 census for Shasta County, for instance, lists 378 individuals (189 males, 7 females, and 182 with no gender indicated), with an average age of 29.[13] Nearly 86% of them had come from other US states, including all but one of the females (she was from Ireland, a 30-year-old woman traveling with two small boys). Ten of the 378 were children under the age of 16, all of them traveling with adults of the same surname.

Judging by the names and birthplaces listed, there were no Asians included in the 1850 census, and quite possibly none in the county (Table 4). More than 96% were from the US, Britain, or western Europe. By 1870, however, Chinese immigrants made up more than 14% of the population of Shasta County. A more-detailed look at the 1870 census shows the breakdown of numbers by race, as identified by the individual (or perhaps by the census taker; Table 5), by age (Table 6), and by place of birth (Table 7). By this time more than 40% of the US citizens had been born in California, nearly all of them under the age of 16. These data show that, while the size and diversity of the population had increased between 1850 and 1870, whites of European ancestry still made up well over 80% of the non-native inhabitants. By far the largest of the other non-native groups were the Chinese.[14]

[13] Available on-line at http://us-census.org/pub/usgenweb/census/ca/shasta/1850/index.txt

[14] Pierson (2008:32), citing Smith 1995, reports that the 1852 census "shows the number of Chinese in Shasta County to be 3,000." However, our search of the on-line database for the 1852 census showed 36 Chinese males and no females. The reason for the discrepancy is unclear, but given that only 104 Chinese were recorded in neighboring Tehama County in 1860 (Reed 1980:5), the 3,000 may be an over-estimate.

Table 4. 1850 and 1870 Censes of Shasta County by Nationality

Place of Birth	1850 Census		1870 Census	
	Count	%	Count	%
US	319	84.4	2,751	71.1
British Isles	33	8.7	251	6.5
Western Europe	12	3.2	192	5.0
Central/Eastern Europe	-	-	54	1.4
Scandinavia	4	1.1	9	0.2
Canada	3	0.8	37	1.0
Latin America	-	-	9	0.2
China	-	-	553	14.3
Australia	2	0.5	3	0.1
Unknown	5	1.3	8	0.2
Totals	**378**	**100.0**	**3,867**	**100.0**

Note: Non-native inhabitants only.

Table 5. 1870 Census of Shasta County by Gender and Race.

Race	Females	Males	Totals	% of Total
Black	2	6	8	0.2
Chinese	5	549	554	14.3
Indian	8	9	17	0.4
Mulatto	14	15	29	0.7
White	1,232	2,025	3,257	84.2
Unknown	1	1	2	0.1
Totals	**1,262**	**2,605**	**3,867**	**100.0**

Table 6. 1870 Census of Shasta County by Gender and Age.

Age	Females	Males
Children (birth-16)	685	786
Young Adults (17–30)	249	551
Adults (31–50)	263	1,024
Older Adults (51–70)	58	233
Elderly (>70)	7	11
Total	**1,262**	**2,605**

Table 7. 1870 Census of Shasta County by Gender and Nationality.

PLACE OF BIRTH	FEMALES	MALES	TOTALS	% OF TOTAL
US (outside California)	567	1,076	1,643	42.5
California	543	565	1,108	28.7
China	4	549	553	14.3
British Isles	82	169	251	6.5
Western Europe	43	149	192	5.0
Central Europe	10	43	53	1.4
Canada	6	31	37	1.0
Latin America	2	7	9	0.2
Scandinavia	-	9	9	0.2
Australia	2	1	3	0.1
Eastern Europe	-	1	1	0.0
Unknown	3	5	8	0.2
Totals	**1,262**	**2,605**	**3,867**	**100.0**
% of Total	**32.6**	**67.4**	**-**	**-**

The Overseas Chinese in Northern California

Chinese sojourners began to arrive in the "Gold Mountain" almost immediately after the first discoveries, mostly from southern China (Table 8). According to the 1852 California census, by that year there were 20,391 individuals who gave their birthplace as China. The immigrants proved to be hard and steady workers for the most part, and thousands were hired to build the California to Utah section of the first transcontinental railroad; many of the railroad workers then turned to mining once the railroad was completed in 1869; others went on to build other railroads, like the Oregon & California north from Sacramento.

Table 8. Timeline of Chinese Immigration and Exclusion.

1848	Gold is discovered at Sutter's Mill in El Dorado County, California; many Chinese arrive to mine for gold.
1850	A Foreign Miners' tax mainly targets Chinese and Mexican miners.
1852	There are approximately 25,000 Chinese in America.
1854	Chinese are banned from giving testimony in court.
1862	The Chinese Consolidated Benevolent Association is formed.
1865	The Central Pacific Railroad recruits Chinese workers, ultimately employing about 15,000.
1869	The first transcontinental railroad is completed; many Chinese workers shift to mining.
1870	California passes a law against the importation of Chinese and Japanese women for prostitution.
1871	Eighteen Chinese are killed in anti-Chinese violence in Los Angeles.
1873	"Panic of 1873": the start of a major economic downturn that lasts through the decade; is blamed on corrupt railroad companies.
1877	Anti-Chinese violence erupts in Chico, California.
1878	The Court rules Chinese ineligible for naturalized citizenship.
1880	There are approximately 106,000 Chinese in America; California passes anti-miscegenation law (no interracial marriage).
1882	The Chinese Exclusion Act prohibits Chinese immigration; the next year, annual Chinese immigration drops from 40,000 to 23.

Note: Adapted from the Stanford History Education Group (http://sheg.stanford.edu/upload/Lessons/Unit%206_Gilded%20Age/Chinese%20Immigration%20and%20Exclusion%20Lesson%20Plan.pdf)

A great deal has been written about the Overseas Chinese and their role in the California Gold Rush (as well as the Western Pacific Railroad and the development of California overall). Particularly good discussions for the planning area are provided by Reed (1980), Tordoff and Seldner (1987), Tordoff and Maniery (1986, 1989), Kelly and McAleer (1986), Hitchcock (1998), Hamusek-McGann et al. (1999), Maniery and Millett (2008), Leland et al. (2015), and various studies done by Sonoma State University for the Lake Oroville project.

The scenario is well known: Overseas Chinese came to California and the West by the thousands to escape poverty and political unrest at home, planning to make their fortunes in the gold fields and then return to China. Like other ethnic groups, they faced discrimination from white miners and settlers, triggered as much by economic greed and the need for scapegoats as by actual racism.[15] Marvin (Waechter and Marvin 2011:26–27) writes that the Chinese were "willing to work long hours for less pay…With such an increase in [the Chinese] population, resentment grew among other groups. Not only were the Chinese able to glean gold from workings that had been abandoned by less patient miners, but they also declined to spend their earnings locally. Instead, they sent it back to their families in China, sending more than $50,000 in gold dust in 1867 alone (Fiorini-Jenner and Hall 2002:66–67)." McDonald (1979:61) notes that in Siskiyou County, "Chinese had come to own a large number of placer mines [that had been abandoned by other miners] by 1870, a situation which alarmed some but pleased…local merchants, stockmen, and farmers who otherwise would have had less business." In another example, a local newspaper reported in 1871 on an "episode of violence between Portuguese and Chinese miners" near Hawkinsville that reportedly "erupted over water rights" (*Yreka Journal* December 6, 1871, cited in LaLande et al. 2015:14).

In retaliation for what they saw as unfair competition, the white miners pressed the government for regulations that would stem the tide of Chinese in the gold fields, including a Foreign Miners Tax, levied in 1850, that was targeted mainly at Asian miners. When the tax proved to be no great deterrent, the government passed the Chinese Exclusion Act of 1882. This act led to a dramatic decrease in Chinese immigrants in California: in April 1853, the *Shasta Courier* newspaper reported that an estimated one thousand Chinese had entered Trinity County in the previous two weeks; most of them began immediately to mine along the Trinity River. By April 1886, the *Trinity Journal* estimated that there were probably only about 40 Chinese in the county, mostly working as cooks and miners.

The archaeology of Overseas Chinese is a productive field of study. In fact, a recent issue of *Historical Archaeology*, the journal of the Society for Historical Archaeology, is devoted entirely to the archaeology of Overseas Chinese railroad workers (SHA 2015). There are a great many period newspaper accounts, census records, mining claims, mercantile inventories, and other documents that provide information on these sojourners, and their archaeological signatures—porcelain "rice" bowls, Chinese Brown-glazed Stoneware storage vessels, *wen* (Chinese coins), gaming pieces, opium paraphernalia, and other artifacts—are much more distinct and recognizable than those of other ethnic groups. Another class of artifacts often found at Overseas Chinese sites are items modified for adaptive reuse, especially in hinterland areas: e.g., tin cans cut, flattened, and punched with nails to make sieves or steamers; wire handles attached to cans to create buckets; *wen* or rounds of cut tin used as wick holders (see examples in Baxter 2004; Kelly and McAleer 1986; Lindström 1993; Lindström and Waechter 2007; and Ritter 1986).

Many of the stone fences, flume/ditch systems, and other features of the cultural landscape have been attributed to the Overseas Chinese. "These particular immigrants were familiar with agricultural irrigation techniques that could easily be adapted to hydraulic engineering for mining…The summer of 1860 witnessed a flurry of flume building by the Chinese" (Kelly and McAleer 1986:5). In hinterland regions

[15] Kelly and McAleer (1986:7-8) state that "there was not much anti-Chinese activity [in Trinity County] until the early 1870s, when Chinese were said to outnumber adult whites … and when a world-wide depression hit in 1873."

of California (including much of the Planning Area), the landscape is dotted with mining sites, railroad workers' camps, colliers' camps, and other types of sites with Chinese "signatures" that have survived largely because of their remoteness (e.g., Baxter 2004; Lindström and Waechter 2007; Ritter 1986; Vaughan 1985b; Waechter 2013; Woodrum 2009b). Studies of these resources can provide valuable insights into nineteenth-century cultural conflict, acculturation, frontier consumerism, and a host of other research topics.

One particularly detailed investigation of Chinese (and general) gold mining in the Shasta/Tehama region is Tordoff's (with Seldner 1987) history and archaeology of the Cottonwood Mining District. The authors use archival research and archaeological investigations at 13 sites/loci to compare Euro-American and Chinese mining practices in the district, their different adaptations, and interactions between the two very different ethnic groups. They identify "at least five overlapping periods of mining development" in the area (1987:227):

- Euro-American exploration and mining (1849–1850)
- Euro-American mining and development of ditch systems, possibly using Chinese laborers (1850s–1860s)
- Euro-American mining and increasing Chinese mining, with many whites switching to other pursuits (1860s–1870s),
- Predominantly Chinese mining (1870s–1880s+)[16]
- Reworking of streams by American dredging companies (1900s).

One point Tordoff makes is that ethnic tensions between the two groups never reached the levels seen in other regions: "…heavily capitalized, White-owned company mining, such as that which occurred in the Mother Lode and Trinity regions, never developed [in the Cottonwood district], and thus, neither did the hostility which frequently accompanied large company mining and Chinese labor" (1987:47). This might explain the dominance of Chinese mining here in the 1870s–1880s, when anti-Chinese sentiments was on the rise in other areas. Interestingly, Kelly and McAleer (1986:10) report less racial friction in Trinity County also, with Chinese miners being given equal rights with Euro-American miners and eventually filing their own claims "to what turned out to be some of the better river areas to mine." Clearly, the relationships between the Overseas Chinese and the non-Chinese in nineteenth-century California were complex and variable, as human interactions tend to be, and should not be over-simplified.

Beyond Gold

We should point out that mining in the Planning Area included more than just gold and silver. Zinc, copper, even platinum were mined in various places. Copper mining, in particular, was an important economic activity:

> During the 1862 rush, miners found that the ore contained other valuable metals, including silver. However, the discovery that copper was also present would have the greatest influence on the area's future development. Copper ore was mined beginning in 1862 in the same area as the Bully Hill gold discoveries. Production was limited because the ore had to be shipped overseas to be processed by smelters in Wales. However, continued exploration revealed an enormous copper belt stretching in an arc for 30 miles through the mountains north of Redding [the Shasta copper-zinc belt]. It became apparent that mines in this area could be very profitable with construction of smelters near the mines. In the 1890s, several large mining companies established operations in

[16] This might have been due in part to completion of the transcontinental railroad, which had employed thousands of Chinese laborers who were now in need of work.

> the copper belt, expanding the mines and building stamp mills and smelters. Copper producers benefited from the growing use of electricity, which created an expanding market for copper [Beason and Wee in Byrd et al. 2008:30].

Kett (1947) describes one of these copper mining areas: Iron Mountain, 12 miles northwest of the town of Redding. He notes that "in the early [eighteen-]sixties William Magee…in association with Charles Camden, secured the property as an iron mine" (1947:108). The Historical Archaeological Research Design (HARD) research group identifies Iron Mountain and several other important copper mines in the Planning Area counties: the Afterthought, Balaklala, Bully Hill, Hornet, Keystone, Rising Star, Shasta King, and Sutro mines in Shasta County; the Big Bend mine in Butte County; the Blue Ledge and Gray Eagle mines in Siskiyou County; and the Island Mountain mine in Trinity County (Caltrans 2008:23). They report that the Iron Mountain Mine "accounted for 42 percent of the state's total production," with fully 54% from Shasta County overall (2008:24). The BLM site record database lists several other, presumably smaller copper mines as well, along with associated ditches, roads, and other features: Lawson Butte (CA-030-1658), Sheep Springs (CA-030-1659), Quartz Hill (CA-030-0161), and possibly the Lemurian Mine (CA-030-1471). Zinc was produced as a by-product of the copper mines.

Clark (1970) describes "copper booms" during the Civil War and again during World Wars I and II, including copper mining in Butte County and in the Shasta copper-zinc belt surrounding what is now Shasta Lake. The West Shasta district and the East Shasta district produced large quantities of copper and zinc ore from the 1890s to about 1920. Kristofors (1973:12) describes the copper belt of Shasta County as "a horseshoe[-]shaped belt" roughly 30 miles long and up to four miles wide, encompassing the towns of Redding, Anderson, and Cottonwood, as well as the Shasta Lake vicinity. In nearby Trinity County, the Island Mountain sulfide deposit, discovered in 1897, yielded nine million pounds of copper between 1915 and 1930 (as well as 144,000 ounces of silver and 8,600 ounces of gold). In addition, small amounts of platinum were mined in Humboldt, Del Norte, and Butte Counties and on the Klamath River (Clark 1970:37, 140, 178, 180). Hislop and Hughes (2007:59) list 10 mines in Tehama County that produced chromium, copper, or both.

Kristofors (1973) summarizes the history of copper mining and smelting in Shasta County between 1896 and 1919, a period when the county "developed into one of the major copper mining regions of the United States, producing nearly 620 million pounds of copper (1973:3). He also describes the environmental damage caused by those activities. Poisonous fumes released by the smelters degraded nearby agricultural lands and forests, leading to what Kristofors calls "one of the earliest cases of federal intervention in a conservation crisis" (1973:xi) when the government forced two of the smelters to cease their operations (see also Bloom 2010).

The Environmental Effects of Mining

As Kristofors and others have shown, mining had (and has) an enormous impact on the physical environment, everything from scattered prospect pits to huge tailings fields to the washing away of entire hillsides with hydraulic monitors (Figure 15). The fact that every type of mining and its resulting features are still visible on the landscape illustrates the duration of these impacts. Adkins (2007) provides a particularly detailed (and damning) picture of the environmental effects of mining along the Trinity River, where siltation and debris destroyed fish runs, disrupted transportation, and increased flooding problems, and how mining in general "rapidly and extensively disrupted the ecosystem of the region" (2007:100). The same was true in all regions where mining took place on a large scale (see, for example, Kristofors 1973).

Hydraulic Mining Scars ▲

Tailings Piles of Ohio Flat ▲

Figure 15. Environmental Effects of Mining.

Placer mining, perhaps the most innocuous method, still caused lasting damage: miners literally moved streambeds, redirecting them into ditches, and removed, sifted, and redeposited the stream gravels looking for the free gold. "Booming," where water was dammed up and then released all at once, cut huge channels into the hillsides. Hard-rock or lode mining left adits, tunnels, shafts, and waste rock in its wake. The most destructive method, however, was hydraulic mining, followed by large-scale dredging.

The cavalier attitude of nineteenth century whites toward these environmental degradations is reflected in an 1853 article in the San Francisco *Daily Alta California* newspaper that describes a new method of mining (hydraulicking) as being "as novel as it is efficient":

> The column of water thus produced [from the hydraulic monitor] ranges from twenty to one hundred feet according to the height of the hill…[S]uch is the immense power of the water as it escapes from the pipe, that no alluvial deposit can resist the force…The toughest clay dissolves like wax, thus disintegrating much fine gold…The excellence of the plan and the wonderful celerity with which the work progresses must be seen to be appreciated…Then witness the operation of the new appliance: the hydraulic apparatus is brought in contact with the debris…which melts like ice under a midsummer sun, and lo! in much less time than it requires to describe the operation, the huge mass is released from its diluvian home and comes tumbling down into the space below…The reduction of manual labor [is] at least two-thirds…[*Daily Alta California*, June 7, 1853].

Despite the "efficiency" of the method, hydraulic mining played a major role in the "conflict that erupted in the Sacramento Valley in the 1880s among mining, farming, and navigation interests" (Billington et al. 2005:313). Although large-scale hydraulic mining was severely curtailed by the Sawyer Decision in 1884, it continued to be employed in Siskiyou and other northwestern counties by impounding the tailings in dams and operating only in specific seasons.

It is hard from our modern vantage point to understand this attitude. It may be that these people assumed the earth would soon heal itself from these assaults, or that they simply did not care; what is clear is that they believed the economic gain was worth the environmental price. This attitude is by no means extinct in the world today.

The Technology of Gold Mining

Detailed descriptions of regional mining history and technological evolution can be found in several sources, including Bailey (2008), Caltrans (2008), Jones et al. (1981), Selverston et al. (2005, 2011), Tordoff (2013), and Waechter and Marvin (2011). Selverston et al. (2011:Chapter 3) describe the evolution of mining from simple placering using pick, shovel, and pan, to ground sluicing, drift mining, lode mining, hydraulicking, and mechanized dredging (Appendix F of that document also provides a useful glossary of gold mining terminology).[17] Those authors also provide a detailed description of the various forms of gold-bearing placers and gravels.

Similarly, McDonald (1979:62–63) describes the "influence of technological, economic, and social developments" reflected in the gold mining industry on the Klamath National Forest, including the Scott and middle/upper Klamath Rivers: first individual labor and low capital investment (surface placers), then, as the easily accessible gravels played out, somewhat more labor-intensive mining of buried placers and load deposits involving water-conveyance systems (dams, ditches and flumes) that caused some miners to pool their resources. Hydraulic mining required large investments in equipment, such as

[17] However, Maniery and Millet (2008:7), citing Williams [1930], report that it was mostly Euro-Americans who participated in the "evolving extraction technology." Chinese miners reportedly continued to use cradles or rockers throughout the nineteenth century.

flumes, pipes, giants, and sluices; dredging and hard-rock mining were also expensive, and soon the lone miner became essentially a thing of the past. These developments paralleled the overall trends in gold mining throughout northwestern California in the second half of the nineteenth century.

Tordoff (2013), Marvin (Waechter and Marvin 2011), Selverston et al. (2011), and others also identify the types of archaeological resources left on the landscape by these various technologies. A slightly abridged version of Marvin's discussion is presented here, with additions. While her discussion is specific to western Siskiyou County and the Klamath region, the technologies were applied throughout the gold mining regions of California.

Placer Mining (1849–1930s)

Placer mining was the initial extraction method used in northwestern California. Granitic rock, quartz lodes, and the contact zones were washed, eroded, and naturally milled, and the native gold concentrated in former and present streams and gravel beds. It was this "freed" or placer gold that attracted the Gold Rush miners. Typical tools included the pan or *batea,* a cradle or rocker, a sluice box, a long tom, or a combination of these. Miners would literally move the streambeds, removing gravels, sifting them, and re-depositing them, all the while storing water in check dams and redirecting the streams into ditches. Typical archaeological remains of placer mining include stacks of sifted gravels and water-rounded cobbles, sometimes in combination with check dams, ditches, channels, and sluice scars. Early mining operations also might include arrastras: circular, animal-driven crushers for breaking down the ore.

River Mining (1850s–1870s)

By the early 1850s, river mining employed water wheels and wing dams constructed to turn the rivers and work their beds, in addition to the long toms or sluices. Vast piles of waste rock were left along the riverine areas as miners employed derricks and booms to remove the heavy rocks from the auriferous sands, which were then sluiced to remove the gold.

Drift Mining (1850s–1900s)

Some miners found placers by digging, often to bedrock, in the old riverbeds. "Coyoting," a technique that was typical of hard-rock mining, was sometimes used in drift mining as well. With this method, the miner would dig a shaft to the pay dirt and then "drift" into the streak from a mine adit. Drift mines, which involved sinking shafts or excavating horizontal adits into the gravel terraces, was an early method of reaching the gold-bearing gravels in the ancient riverbeds. Gravels were extracted from shafts with windlasses or small headframes, while adits (mine entrances) defined horizontal workings, as did ore cars and tracks.

Hard-rock (Lode) Mining (1850s-present)

Hard-rock mining for gold began in 1850s but was never as rich or productive in the planning area as in the Mother Lode of the Sierran foothills. Although this method of exploration is largely a subsurface operation involving prospecting for gold-bearing quartz veins, it did leave many surface remains. Technological developments in mining and milling of ore were necessary to make the working of the lode deposits profitable: air drills, pumps, rock crushers (stamps), vanners, and the like. Because of the relatively greater investment needed for this technology, it usually involved several miners or a mining company. The most recognizable archaeological remains of hard-rock mining are adits, shafts, and tailings aprons; in some cases mill structures or foundations, stamp mills, ore cart rails, or timbers from headframes or adit shoring also survive.

Ground Sluicing and Booming (1850s–1900s)

Ground sluicing and booming, early hydraulic methods of washing soils by gravity down a hill to pan or sluice the remains at the bottom, was common in the second half of the nineteenth century. These types of mining activities also required large amounts of water delivered through ditches and flumes. In ground sluicing, the ditch water was turned down the hillside to wash the dirt into the sluices at the lower elevations. Booming involved building a reservoir, letting it fill up, then cutting the dam and allowing the water to rush downhill, cutting great channels 10 or more feet deep into the hillsides. The reservoirs and ditches from these technologies are still visible in many places on the landscape today, although these same features can also represent other types of mining. Earthen sluice traces and stacked-rock sluice supports can also be found, though these tend to be more subtle and harder to identify (Figure 16).

Hydraulic Mining (1870s–1930s)

By the 1870s, hydraulic mining was the most popular and productive form of mining the benches and terraces along rivers and their tributaries. Miles of ditches, flumes, and reservoirs were constructed to bring water to the mines and power the monitors that cut away the banks to recover the gold in long sluices. Working day and night (with pitch torches), first white and later Chinese miners cut away miles of riverbanks (Figure 17).

Hydraulic mining had actually begun in the Mother Lode in the 1850s, when Anthony Chabot attached a wooden nozzle to a canvas hose and washed ancient river gravels. Over the next 20 years, miners improved upon Chabot's design, developing the "little Giant" that would be used for more than 100 years thereafter. The Giant, or monitor, required vast amounts of gravity-fed water at high head to spray on the ancient river gravels. Torrents of water would melt away boulders, trees, gravel, and dirt, all mixed with gold. This technique, always the most successful method of extracting placer gold, reached its peak in the 1880s and 1890s, when miles of ditches, flumes, reservoirs, tunnels, and pipelines were constructed to supply water to the operations. Hydraulic mining, with its sheer hillsides and large open pits, created the dramatic landscapes seen today along many rivers and creeks in the mining regions of northern California.

Dredging (1890s–1950s)

By the 1890s, dredge mining was finding success in Montana and New Zealand and word had spread to California. Selverston et al. (2011:3–21) describe the process this way:

> The gold dredge that evolved in California consisted of a barge that contained the machinery to excavate, process, and discharge gravels from gold-bearing deposits. The dredge floated in the river itself, or as it worked its way away from the river, in its own traveling pond. The excavation of the gravels was accomplished with a continuous chain of large iron buckets, not unlike a huge chainsaw blade, lowered from one end of the barge. It scooped material from the bottom of the pond and its bank and conveyed it onto the barge, where it was dropped into a mechanized sluicing device for gold recovery. The processed tailings were taken off the barge from the rear, by a long conveyer to be deposited on the opposite bank of the pond in large arc-shaped tailings piles. The earliest versions of these bucket-line dredges used steam power; electrical power soon took over, followed later by power from internal combustion engines.[18]

[18] Newland et al. (2011) report on their evaluation of a 5,000-acre dredge field at Oroville (CA-BUT-465H).

Earthen Sluice Trace ▲

Rock Sluice Support ▲

Figure 16. Earthen Sluices and Rock Sluice Supports.

Late 1890s ▲

Photo Courtesy of University of California, Davis
Department of Special Collections

Today ▲

Figure 17. Hydraulic Mining at the Huey Hill Placer Mine Siskiyou County.

Tordoff (2013:45–61) defines and illustrates two types of dredging: bucket-line (described above) and dragline. She describes bucket-line dredging as "mining on a fantastic scale" (2014:45), and notes that the first *wooden* dredge used anywhere in the world was operated on the upper Trinity River. The dredge tailings are now inundated by Trinity Lake. Dragline dredging involved a smaller, more portable dredge (sometimes called a "doodlebug") and was used during the Great Depression. The most tell-tale sign of dredge mining on the landscape today are tailings, sometimes quite extensive, either in "high, arcing piles of rock…strung out in long lines…that double back on themselves" (Tordoff 2013:73), low, straight rows, or (for dragline dredging) in isolated or clustered conical piles.

Mining Districts in the Planning Area

Several major mining districts developed in the planning area during the nineteenth century, and archaeological surveys in these districts have recorded associated resources ranging from scattered prospect pits and small tailings piles to huge complexes of mine workings, support facilities (blacksmith shops, powder houses, etc.), workers' housing, hydraulic cuts, waste rock, and extensive ditch/reservoir systems. Clark (1970:13) lists three "Principal Gold Districts" within our area: Oroville and Magalia in Butte County, and French Gulch in Shasta and Trinity Counties. He also describes dozens of "areas within [the primary districts] that, in the past, have been themselves loosely called "districts" (1970:185). Table 9 lists all of the "areas" and "districts" shown on Clark's Plate 1 and on our Figure 14 that fall into the current planning area. Relatively few of these, however, fall within lands currently managed by BLM.

Shasta and Trinity Counties

Clark's Klamath Mountains Province takes in portions of all of our regions except the Southern Cascade Foothills and Sierra Nevada. However, the vast majority of BLM-managed lands within this province are concentrated in east-central Trinity and west-central Shasta Counties, between the North Fork Trinity River and Shasta Lake. Within this zone is one of Clark's "Principal Gold Districts" (French Gulch), as well as several other major mining areas: Shasta, Redding, Whiskeytown, Weaverville (which includes the famous LaGrange hydraulic mine), and many more. Within the French Gulch district were two principal lode (hard-rock) mines: the Brown Bear, which produced more than $15 million in gold; and the Gladstone, at $6.9 million (Clark 1970:Table 7). It also includes the Washington, the first lode mine every worked in Shasta County. According to Clark, the French Gulch district has been the most productive source of lode-gold in the Klamath Mountain Province.

The largest and best-known of the hydraulic mines in the Trinity region (and one of the largest in California) was the LaGrange Mine, located in Oregon Gulch just west of Weaverville. It was said to have produced $3,500,000 in gold between 1893 and 1918 (Wee and Costello 2001:12). To head-off prospective lawsuits over its dumping of tailings and other debris, the LaGrange Hydraulic Mining Company actually purchased a "right-of-way" stretching four and half miles down Oregon Gulch to the Trinity River, where they could legally discharge detritus from their hydraulic operations. This area included the town of Oregon Gulch, which "was eventually covered with debris to an estimated depth of four to five hundred feet" (Adkins 2007:171). Costello and Wee (2000) and Wee and Costello (2001) have prepared an in-depth historical context and evaluation reports for the LeGrange Mine Historic District and Oregon Gulch. The mine has been determined eligible for listing on the National Register, and it is a California State Historical Landmark (No. 778). It seems somewhat ironic that, in the 1930s, the State Highway Commission used hydraulic giants from the abandoned LaGrange Mine to cut a right-of-way through Oregon Mountain for State Route 20 (now State Highway 299), washing more than 10 million cubic yards of material into the open pit of the mine (Wee and Costello 2001:17).

Table 9. Primary Mining Districts in the Planning Area (from Clark 1970, with additions).

DISTRICT	COUNTY	PRINCIPAL TYPE(S)[a]	PRIMARY PERIOD(S) OF OPERATION[a]	NOTES/RELATED STUDIES
SIERRA NEVADA PROVINCE				
Bangor-Wyandotte	Butte	Placer, Drift, Hydraulic	1850s–1890s	-
Bidwell Bar	Butte	Placer	1848–1850s	-
Butte Creek	Butte	Placer, Drift, Hydraulic, Dredge	1850s–1920s	-
Cherokee	Butte	Hydraulic, Diamonds	-	-
Clipper Mills	Butte/Yuba	Drift, Hydraulic	-	-
Concow	Butte	Placer, Lode	-	-
Forbestown	Butte	Placer	1848–1900s	-
Honcut	Butte	Dredge	-	-
Hurleton	Butte	-	-	-
Inskip	Butte	Lode	ca. 1900s	-
Kimshew	Butte	Drift, Hydraulic	-	-
Magalia	Butte	Placer, Lode	ca. 1850–1890s	-
Merrimac	Butte	Placer, Lode	"During and after Gold Rush"; 1930s+	-
Mooreville Ridge	Butte/Plumas	Hydraulic	-	-
Mooris Ravine	Butte	Placer, Lode	ca. 1849–1916	-
Oroville	Butte	Dredge, shallow placer	1848–1863, 1893–1916[b]	Newland et al. (2011); Praetzellis et al. (2006); Selverston et al. (2005, 2011)
Polk Springs	Tehama	-	-	-
Yankee Hill	Butte	Placer, Lode	ca. 1849–1900s, 1933–1942	-
KLAMATH MOUNTAINS PROVINCE (INCLUDES SHASTA/TRINITY REGION)				
Backbone	Shasta	-	1886–1913	-
Bully Choop	Trinity	Lode	late 1880s-early 1900s	-
Callahan	Siskiyou	Placer, Bucket-line dredge	-	-
Cecilville	Siskiyou	Placer, Lode	-	3,000–5,000 Chinese miners reportedly worked the Salmon River "by means of flumes and wing dams" (Clark 1970:134).
Centerville	Shasta	Lode	-	-
Clear Creek	Shasta	Placer	-	-

Table 9. Primary Mining Districts in the Planning Area (from Clark 1970, with additions) *continued*.

DISTRICT	COUNTY	PRINCIPAL TYPE(S)[a]	PRIMARY PERIOD(S) OF OPERATION[a]	NOTES/RELATED STUDIES
KLAMATH MOUNTAINS PROVINCE (INCLUDES SHASTA/TRINITY REGION) continued				
Coffee Creek	Trinity	Placer, Lode, Dragline dredge	-	-
Cottage Grove	Siskiyou	-	-	Site of very early mining camp on the Klamath River near its junction with the Salmon (Waechter and Marvin 2011:17).
Cottonwood	Siskiyou	Placer, Lode	-	-
Cottonwood	Shasta	Placer, Dredge	-	-
Deadwood	Siskiyou	Placer, Lode, Dredge	-	-
Deadwood	Shasta	Placer, Lode	-	-
Dedrick-Canyon Creek	Trinity	Lode, Hydraulic	1880s–1930s	-
Dillon Creek	Siskiyou	Placer, Drift	"Gold Rush"; 1953–1960	-
Dog Creek	Shasta	Placer, Lode	"Gold Rush"; 1890s–1900s	-
Dorleska	Trinity	Lode	1890s and later	-
Forks of Salmon	Siskiyou	Placer	1849 and later	-
French Gulch	Shasta/Trinity	Placer, Lode	1849-ca. 1914	Includes first quartz (lode) mine worked in Shasta County (Washington Mine).
Gas Point	Shasta	-	-	-
Gazelle	Siskiyou	Lode	1880s–ca. 1907	-
Gilta	Siskiyou	Placer, Lode	mostly pre-1900	-
Gottville	Siskiyou	Placer	-	-
Hamburg	Siskiyou	Placer	ca. 1852–1860[c]	Operations included construction of wingdams, derricks, sluices, and Chinese pumps (Waechter and Marvin 2011:33).
Harrison Gulch	Shasta	Placer, Lode	1896–1914	-
Helena-East Fork	Trinity	Placer, Lode	-	-
Hoopa	Humboldt	Placer, Lode	-	Copper/Gold district; some of the gold recovered as a by-product of copper mining.
Hornbrook	Siskiyou	Placer	-	-
Humbug	Siskiyou	Lode, Dredge	-	-
Igo-Ono	Shasta	Placer, Hydraulic, Drift, Dredge	ca. 1851–1890; 1933–1959	See Ritter (1986).

Table 9. Primary Mining Districts in the Planning Area (from Clark 1970, with additions) *continued*.

DISTRICT	COUNTY	PRINCIPAL TYPE(S)[a]	PRIMARY PERIOD(S) OF OPERATION[a]	NOTES/RELATED STUDIES
KLAMATH MOUNTAINS PROVINCE (INCLUDES SHASTA/TRINITY REGION) continued				
Indian Creek	Siskiyou	Placer, Hydraulic	ca. 1848 and later	Also included Gray Eagle copper mine (Waechter and Marvin 2011:24).
Jelly (Ferry)	Tehama	Placer, Dredge	-	Chinese miners used ground sluicing to mine the gold-bearing gravels.
Knownothing	Siskiyou	Placer	-	-
Liberty	Siskiyou	Placer, Lode	1850s–1910	Also known as the Black Bear district.
Minersville	Trinity	Placer, Lode	-	-
Monumental	Del Norte	Lode	ca. 1900 and later	-
New River-Denny	Trinity	Placer, Lode	1849 and later; 1930s	-
Oak Bar	Siskiyou	-	-	-
Old Diggings	Shasta	Hydraulic, Lode	"Gold Rush"; 1904–1919; 1930s	Also known as the Buckeye district.
Orleans	Humboldt	Placer, Hydraulic	ca. 1849-early 1900s; 1930s	-
Oro Fino	Siskiyou	Placer, Lode	"Gold Rush" and later; 1930s–1940s	-
Platina	Shasta	Placer	-	-
Redding	Shasta	Placer, Lode, Dredge	1848 and later; 1930s	Originally "Reading"
Sawyers Bar	Siskiyou	Placer	-	-
Scotts Bar	Siskiyou	Placer, Hydraulic, Lode	1850 and later	-
Seiad	Siskiyou	Hydraulic, Dredge	-	Also included several chromite mines (Waechter and Marvin 2011:24).
Shasta-Whiskeytown	Shasta	Placer, Dragline Dredge	1849 and later; 1930s	Hamusek-McGann et al. (1999): study of 18 historic-era mines in the Whiskeytown area. Bevill and Nilsson (2001): historical overview of Whiskeytown-Shasta-Trinity NRA.
Smith River	Del Norte	Placer, Hydraulic	1850s–1870s	Chrome also mined here during WWI and WWII.
Snowden	Siskiyou	Placer	-	-
Somes Bar	Siskiyou	Placer	-	-
Stuart Fork	Trinity	-	-	-

Table 9. Primary Mining Districts in the Planning Area (from Clark 1970, with additions) *continued*.

DISTRICT	COUNTY	PRINCIPAL TYPE(S)[a]	PRIMARY PERIOD(S) OF OPERATION[a]	NOTES/RELATED STUDIES
KLAMATH MOUNTAINS PROVINCE (INCLUDES SHASTA/TRINITY REGION) continued				
Weaverville	Trinity	Placer, Hydraulic, Dragline Dredge	1848–1942	Includes the La Grange Mine (see text). Costello and Wee (2000), Wee and Costello (2001).
Trinity River	Trinity, Humboldt	-	-	Adkins (2007); Bailey (2008); Tordoff (2013)
Big Bar	-	-	-	-
(Fool's) Paradise	-	Placer, Lode	-	-
Burnt Ranch	-	-	-	-
Carrville	-	Placer, Lode, Dredge	-	-
Cottonwood Creek	-	-	-	-
Dodge	-	Placer	-	-
Douglas City	-	Placer	-	-
Eastman Gulch	-	Placer, Lode	-	-
Happy Camp	-	Dredge	-	-
Hayfork	-	Hydraulic, Dragline Dredge	-	-
Indian Creek	-	-	-	-
Junction City	-	Hydraulic, Dredge	-	-
Lewiston	-	Placer	1850s-ca. 1900	Also known by other names, including Ohio Flat. Kelly and McAleer (1986)
Poker Flat	-	Placer	-	Name possibly derived from "Polka Flat," reflecting large percentage of German miners.
Salyer	-	-	-	-
Shasta Copper/ Zinc Belt	-	Lode	1850s–1950s	Gold, silver, copper, and zinc mined here. Includes West Shasta and East Shasta districts, the latter partially inundated by Shasta Lake.
Trinity Center	Trinity	Placer, Dredge	-	-
Yreka	Siskiyou	Placer	-	Also known as the Hawkinsville district.

Table 9. Primary Mining Districts in the Planning Area (from Clark 1970, with additions) *continued*.

DISTRICT	COUNTY	PRINCIPAL TYPE(S)[a]	PRIMARY PERIOD(S) OF OPERATION[a]	NOTES/RELATED STUDIES
COAST RANGES PROVINCE				
Smith River	Del Norte	Placer, Hydraulic	1850s–1870s	-
Crescent City	Del Norte	Placer	1850s and later	Small-scale operations to recover gold and some platinum from black sand deposits on beaches
Monumental	Del Norte	Lode	ca. 1900 and later	-
Island Mountain	Trinity	Lode	1915 and later	Sulfide deposits mined for copper, silver, and gold
Orick	Humboldt	Placer	1852–1880s	Small-scale operations to recover gold and some platinum from black sand deposits on beaches

Notes: [a] Information from Clark (1970) unless otherwise noted; [b] From Selverston et al. (2011); [c] From Marvin (Waechter and Marvin 2011).

In the last decades of the nineteenth century, mining remained a primary economic activity in most of northwestern California. When hydraulic mining was outlawed in the Mother Lode mines by the 1884 Sawyer decision, because of the tons of debris it sent down into the Central Valley waterways, many hydraulic operations moved into "the state's isolated northwestern counties, whose westward-flowing rivers and drainages were exempt from the ban" (Bailey 2008:6–7).[19] By 1898, there were 327 hydraulic mines "working or claimed" in Trinity County (Adkins 2007:171); the LaGrange would continue operating for another 20 years. Overall, mining along the Trinity River "helped create and sustain the county's economic base [and] reflected significant advances in mining technology over time: from pan and waterwheels, to hydraulics, and finally to dredges" (Bailey 2008:7).

The Shasta/Trinity area encompasses perhaps the most thoroughly studied of all historic mining districts in the planning area. Costello and Wee (2000) and Wee and Costello (2001) have produced in-depth studies of the Oregon Mountain Summit and LaGrange Mine historic properties and archaeological remains in Lower Oregon Gulch; Bevill and Nilsson (2001) and Hamusek-McGann et al. (1999) have researched historical mining in the Whiskeytown area; Kelly and McAleer (1986) carried out archaeological investigations at one site in the Lewiston/Ohio Flat district; Ritter (1986) has done a study of a Chinese mining venture near Igo; Sundahl and Ritter (1997) report on excavations at two multi-component sites that include evidence of Chinese occupation; Vaughan and Ritter (1992) discuss one of the most important gold mining districts in Shasta County (Clear Creek), as well as Chinese miners in the region, types of mining technology used, and early settlements; and Tordoff (with Seldner 1987) writes about the history and archaeology of the Cottonwood Mining District south/southwest of Redding, predominately a placer mining area with limited hydraulicking. Valuable historical studies of mining along the Trinity River have been done by Adkins (2007), Bailey (2008), Rich (2014), and Tordoff (2013). Additional information on gold mining in the region is available from single-site investigations by LaLande et al. (2015); Vaughan (1986); and Vaughan and Ritter (1992).

The Mother Lode

Although the planning area does not extend into the heart of the "Mother Lode" as it is typically defined, Selverston et al. (2011:3–5) point out that "there are lode deposits throughout the Sierra Nevada in addition to the interconnected Mother Lode, including some in eastern Butte County."[20] Some of the most recent (and most thorough) historical overviews of gold mining in California can be found in a series of reports by Sonoma State University on the archaeology of Lake Oroville (see, in particular, Selverston et al. 2005, 2011; Walker and Phil 2015). These studies rely heavily on primary sources, including Gold Rush diaries and historic maps, to describe the early history of eastern Butte County.

Among the most productive of the northern lode-mining districts in Butte County were the areas around Forbestown, Yankee Hill, and Magalia near what is now Lake Oroville (see Figure 14). However, lode mining was not the main activity, at least in the vicinity of the reservoir: of the 292 sites with gold mining property types within the Lake Oroville FERC boundary, Selverston et al. (2011:Table 3.2-197) identified 97 sites with placer mining remains but only 12 with lode mining features.

BLM-managed lands in Butte County are mostly concentrated along Butte and Big Chico Creeks and the West Branch, Middle Fork, and South Fork of the Feather River. Important mining districts in

[19] Adkins (2007:149-155) gives a detailed account of the "intricate legislative and legal battles" that led up to the Sawyer Decision.

[20] According to these authors, the "prevailing definition" of the Mother Lode includes a 120-mile-long area between Mariposa and northern El Dorado County. We question this definition, as it appears to omit the major lode-mining zones in Placer and Nevada Counties.

these areas included Butte Creek (on Butte Creek), Magalia, Bidwell Bar, Yankee Hill, Cherokee, and Forbestown. Clark (1970) describes these districts in detail; the following are brief summaries of that text.

Butte Creek was primarily a dredging area that extended for nearly 12 miles along the creek, between Chico and Centerville. Clark (1970:32) reports that there was some placer, hydraulic, and drift mining as well, in the early years, but by the beginning of the twentieth century the creek gravels were being "worked with primitive power shovels and washing plants." Selverston et al. (2011:3-43 to 3-44) cite several archaeological studies of the Butte Creek area, including Elliot's 1995 thesis on BUT-854/H, a mining camp that has been listed on the National Register (period of significance 1850–1874); and another mining camp, BUT-1106/H, investigated under an agreement between BLM and California State University, Chico (Kraft 1998; Ritter 1989).

The Magalia district, 15 miles northeast of Chico, was "extensively mined during and after the gold rush [sic]" and was "one of the most productive placer mining districts in the state," with much of the gold coming from drift mines (Clark 1970:88). The major drift mines were the Emma, Indian Springs, Magalia, Pershbaker, and Royal mines. The Magalia district also produced the 54-pound "Willard nugget" in 1859.

Bidwell Bar, one of the earliest of California's Gold Rush settlements, was named for John Bidwell's second discovery of gold on the Feather River in 1848. According to Clark, however, "the gravels were exhausted in a few years and the miners moved elsewhere" (1970:30). It now lies inundated beneath the waters of Lake Oroville.

The extensive Yankee Hill mining district saw both placer and lode mining. Like many areas, Chinese miners reworked the "exhausted" placers after the white miners had moved on. Within the district, the Surcease mine was worked "on a major scale" in the 1890s–1900s, yielding more than $1 million in gold, and the Big Bend mine produced copper during the Second World War (Clark 1970:131).

The output of the Cherokee district, supposedly named for a "party of Cherokee Indians who migrated here in the 1850s to mine gold" (Clark 1970:36), came mostly from its single large hydraulic mine of the same name. The Cherokee mine produced about $15 million during the course of its operations, some of it in the form of diamonds recovered from the gold-bearing gravels.

Forbestown is 15 miles due east of Oroville. Placer mining during the Gold Rush yielded "huge amounts of gold" from the South Fork Feather River (Clark 1970:49). One major mine within the district was the Gold Bank, which operated "on a major scale" from 1888 to 1904. Clark (1970:49) tells us that moderate mining activity continued here through the 1930s.

Logging and Lumbering

In nineteenth- and early twentieth-century California, mining, logging, and settlement went hand-in-hand. Mining—particularly lode mining—required vast quantities of wood for timber shoring, headframes, steam power, and building construction. In his description of travels through the region in the late 1850s, Isaac Cox remarked that "every mining camp along the Trinity River had its own sawmill" (Adkins 2007:98). Much of the lumber was used to build flumes in the river canyon, to carry water to the placers and to power hydraulic monitors. One local Trinity lumberman, Franklin Buck, estimated in the summer of 1856 that he had sold more than 100,000 board feet of lumber to the mines (Adkins 2007:99). Wooden flumes were also constructed to move logs from the timber stands to the mills, as with the historic Chico Flume, the Empire Flume, and the Blue Ridge Flume in the Shasta/Tehama region (Hutchinson 1956; Smith 1992; Woodrum 2009b).

Gradually the scale and intensity of logging in all forested areas of northwestern California evolved from water-powered sawmills and oxen to transport the logs to the mills, to steam-driven sawmills, steam donkeys, and logging railroads. The remains of these activities can still be seen in many

locations, in the form of narrow-gauge railroad segments, donkey sleds, boilers, work camps, and other archaeological sites and features.

The markets also expanded, from local mining interests and residents to "far-off destinations such as San Francisco, Hawaii, Australia, and the Philippines" (Adkins 2007:132). The spread of settlement meant an increased demand for wood as well, to build cabins, corrals, stores, and other structures. Both of these activities stimulated the local lumber industries throughout the north state. Small sawmills arose to supply the local areas, especially in more remote areas that could not easily access larger markets, while large lumber operations served major towns and regions.

Logging the Redwoods

Redwood lumbering in the North Coast Ranges began in the 1850s and quickly became one of the most important economic activities, especially in Humboldt and northern Mendocino Counties. The first sawmills sprang up along Humboldt Bay in 1850, and though many failed within a year, by 1860 Humboldt had become the second-ranking county in California in the production of lumber, sawing 30,000,000 board feet annually. The June 6, 1861 edition of the *Alta California* reported that "[l]umbering is the main occupation and source of employment" in the Humboldt Bay region. According to Irvine (1915:113), lumber companies cut nearly six *billion* board feet of redwood lumber between 1889 and 1913. Most of the lumber was shipped to the San Francisco market (Bearss 1969). Redwood lumbering created perhaps the first millionaires in Humboldt County, including Canadian lumberman William Carson, whose 1884 Victorian mansion—built almost entirely of redwood—still stands in the town of Eureka.

Not only redwoods were logged, however. As the local industry expanded, lumber companies also cut stands of Port Orford cedar, Douglas-fir, tanoak, and several species of pine. In the early years, horse-drawn carts carried the logs to the edge of Humboldt Bay (Carranco and Sorensen 1988); eventually they were replaced by machinery, as the lumber companies built the first railroads in California. By 1854–1855 there were already 20 miles of these railways in Humboldt County, and more were constructed as the closer timber stands were cut over and the lumber companies had to go farther afield. Several studies within the mill town of Falk, near Eureka, provide insight into the daily lives of workers in the local lumber industry in the late nineteenth and early twentieth centuries (Bryant and Rich 2011; Heald 2002; Rich and Roscoe 2009).

Logging the Interior

In other regions, particularly the dense timber stands of the Klamath Mountains and High North Coast Ranges, logging was and is an economic mainstay. Although Adkins (2007:201) says that logging and milling did not occur on an industrial scale in the Trinity River Basin until after World War II, the County Assessor's Reports of County Statistics list 18 water-powered sawmills in Trinity County by 1858. Sawmills were established along the Klamath, Scott, Salmon, and Trinity Rivers and their larger tributaries; Belden (1997) identifies a total of 44 sawmills in Trinity County alone. Most were run by water power or steam, and later by gas-powered engines. In the early years logs were moved downriver to the sawmills or hauled out by high-wheeled wagons and teams of oxen or horses. Early-on, sawmills often were mobile, self-contained features that were moved to new locations when all the merchantable trees in an area had been cut down. Rivers or draft animals were used to transport the logs to the mills. The work crews typically consisted of a cook, several choppers, a few sawyers, and additional workers to peel and ring the trees after they were felled. Logging camps were set up, and might include shanties for housing workers, a cookhouse, a storehouse, a repair shop, and a barn for the animal teams.

Some of the earliest logging in the Planning Area, however, took place in the upper Sacramento Valley: Bevill and Nilsson report that the "first recorded incident of logging in present-day Shasta County occurred in 1844," in the vicinity of what is now the town of Cottonwood (Bevill and Nelson 2001:127). The

logs were rafted downstream to Johann Sutter's fort at New Helvetia (Sacramento). The lumber industry did not really take off, however, until the Gold Rush triggered an immense need for flumes, dams, mine timbers, mills, cabins, and other wooden structures. Smith (1997:47) tells us that the first lumber mill in Tehama County was built in ca. 1851, on the Sacramento River above Mill Creek. In Shasta County, there were at least eight sawmills by 1852—"all but one located in the Horsetown and Whiskeytown mining districts" (Bevill and Nilsson 2001:128). The lack of good roads, however, limited the amount of lumbering to the hills on either side of the Sacramento Valley. The forested mountains east of Redding and Red Bluff were not logged to any great degree until the mid-1860s, and areas to the north not until the early 1870s. The construction of the California & Oregon Railroad to Redding in 1872 and on to Oregon in the early 1880s provided an easier way to move lumber to market and expanded local operations (Bevill and Nilsson 2001:131).

Railroad Logging

Railroad logging in California's timberlands has been the subject of books, magazine articles, historical society publications, tourist attractions, and historical/archaeological studies. These railroads began as a way to access remote regions that had no developed road systems, and expanded to reach increasingly distant timber stands. This created a need for remote camps for the workers and a system for transporting the logs. Logging railroads served both purposes, moving portable camp structures ("skid shacks") into the woods and logs back out to the mills. Railroads were expensive to build, however, and railroad logging systems "required a larger and more highly skilled workforce and more capital outlay" (Caltrans 2013:96).

Miller (2014) describes several of the logging railroads in the North Coast region, including a two-mile-long rail system from Union (Arcata) to Humboldt Bay that was later incorporated into the Arcata and Mad River Railroad; the McKay & Company Railroad; and the short-line Freshwater Railroad. The latter was eventually acquired by the Pacific Lumber Company and operated into the 1940s. Borden (1958) presents a history of the Oregon & Eureka Railroad, which operated for only nine years (1903–1911). Carranco and Sorensen (1988) provide a detailed discussion of railroad logging in Humboldt County from 1854 to the 1930s, when rubber-tired vehicles took over the job of transporting logs from the forest to the mills.

Many logging railroad systems were active in other regions as well, including those operated by the LaMoine Lumber and Trading Company in Shasta County (Vaughan 1985a), the Red River Lumber Company in Shasta and Lassen Counties (Maniery and Baker 1997); the McCloud River Lumber Company in Siskiyou County (Elliott 1990; Vaughan 1985b); the Butte & Plumas Railway Co. (Robertson 1998); and others. On the Klamath National Forest alone, 15 different railroad logging systems were in operation in the late nineteenth and early twentieth centuries, with another 11 on the Shasta-Trinity (Tamez et al. 1988:76–78). Many others operated just to the south, in the Sierra Nevada timber zones.

Tamez et al. (1988) identified four primary research domains for railroad logging in California: environment, technology, economics, and society and culture. Their "Contextual History for Railroad Logging in California" was prepared as part of a Programmatic Agreement between the US Forest Service Region 5 (California), the State Office of Historic Preservation, and the Advisory Council on Historic Preservation, for the treatment of railroad logging systems on National Forest lands. Several studies followed from that research design, including those by Elliott (1990) and Vaughan (1985a, 1985b). More recently, a historical context and archaeological research design for work camps, including logging and lumber camps, has been published by the HARD research group (Caltrans 2013). That publication presents contextual background, property types, and research themes for railroad logging camps, and borrows Conners' (1990) ranking system for determining the integrity of archaeological remains associated with those camps.

MARITIME ACTIVITIES

Although limited geographically, maritime activities have been important on the North Coast since the beginning of the historic period in northwestern California. These have included early explorations (see that section, above), economic pursuits, military undertakings, and boating/lifesaving operations. The Humboldt coast, in particular, has a long history of commercial fishing and canneries, shipping of lumber and other commodities, and lighthouse facilities. Commercial fishing (of salmon in particular) began in the 1860s and continues to be a major part of the local economy today.

Fishing and Whaling

The salmon fishery and canning industry on the North Coast are well known. What is less commonly known, however, is that whaling was also a busy industry along the California coast throughout the second half of the nineteenth century (Bertão 2006; Caltrans 2013; Warrin 2007)." Before 1850, the coastal whaling industry took precedence, followed by the state's salmon fisheries. California's early whaling and fishing industries were dependent on the exportation of their products" (Caltrans 2013:128). As on the East Coast, the principal product was whale oil. According to Bertão (2006), most of the whalers on the California coast were Portuguese from the Azores.

Obviously most of this activity took place offshore, but the whaling industry also created facilities on land:

> In cities, whalers often lived in boardinghouses, but in rural areas along the California coast they created their own housing by erecting cabins and outbuildings (Bertão 2006:14–16)…Shore whalers built their facilities in sheltered harbors, atop bluffs, using the beach below to anchor the whales. Whaling companies generally operated out of a single strategic building used to store supplies, to hold meetings, and to serve as a hospital, if needed. Married whalers usually secured their own quarters or built their own dwellings. When whaling operations shut down, buildings were often dismantled and relocated to another site (Bertão 2006:27–29). In some whaling camps, whalers cultivated small gardens and raised animals for food [Caltrans 2013:129].

Caltrans (2013:Table 4) lists three known whaling stations within the Planning Area counties: Whaler Island in Crescent City Harbor, operating from 1885 to 1895; Trinidad Bay, used for an unknown period beginning in 1861; and Buhne Point in Humboldt Bay, from 1855 to an unknown end-date. According to Warrin (2007), the whaling industry continued sporadically in California until 1972. To our knowledge, no whaling- or fishing-related sites have been identified on BLM-managed lands in the Planning Area.

Shipping

As early as the 1850s, Humboldt Bay developed a small export lumber industry (Paterson et al. 1978:15). The lack of a good road system meant that sawmills had to be close to the bay for ease of shipment of finished redwood lumber from the Humboldt and Mendocino coasts to San Francisco. Paterson et al. (1978) report that, at the turn of the twentieth century, there were 50 lumber ports along "the redwood coast," served by a fleet of lumber schooners that anchored in Humboldt Bay. These ships were "the main link to the outside world" until the construction of a railroad between Eureka and San Francisco in 1914. Even then, shipping remained a primary mode of transport for the local redwood industry: in 1915 Irvine reported that "[a]t this time redwood shingles can be shipped from Humboldt Bay to Chicago on a sixty cent rate and to New York and Boston via the Isthmus of a sixty-seven and a half cent rate…" (Irvine 1915:119).

In addition to redwood, these ports processed and shipped bark from the tanoak or tanbark oak tree, a common understory species in redwood forests. The bark, rich in tannins, was used to tan leather goods, and by the late nineteenth century the harvesting and shipping of tanbark was a major economic activity along the North Coast. Irvine (1915:120) tells us that "the quality of tan bark found in this county is the very highest," and that "thousands of cords of tan bark have been shipped out of the county, and there are still many thousands of cords to be gathered." The industry continued to thrive into the first decades of the twentieth century, when the loss of large tanoak trees caused it to decline.

Aids to Navigation

To aid in shipping and navigation in general, various entities and individuals built lighthouses along the California coast. Within the Planning Area, these include the Battery Point Light at Crescent City (1856–1982), the Cape Mendocino Light (1868–1970s, subsequently dismantled and reassembled at Mal Coombs Park in Shelter Cove), the Punta Gorda Light (1912–1951), the Point St. George Reef Light (1982–1975), the Humboldt Harbor Light (North Spit, 1856–1892; abandoned and replaced by the Table Bluff Light), the Table Bluff Light (1892–1961), and the Trinidad Head Light (1871-present; Figures 18 and 19).

The Humboldt Harbor Light once stood on the North Spit of Humboldt Bay behind the Coast Guard Station. It was abandoned in 1892 in favor of a higher lighthouse on Table Bluff. The older lighthouse collapsed in 1933, but foundation ruins remain. These ruins were recorded by BLM archaeologists in 1983 as site HUM-662H. Test excavations were conducted here, but the results have not yet been written up. The recovered artifacts are curated at the BLM office in Arcata. The site was determined ineligible for the National Register, because it lacked integrity (Pfilf 1995). The Table Bluff Light was constructed on a promontory south of the bay, above the South Jetty. Grangaard (2002:9) reports that the nearby town of Table Bluff once contained "a hotel (built by Van Aerman in 1852), a saloon, blacksmith shop, livery stable, general store, schoolhouse, dance hall, grange, church, six homes, and a post office established in 1861." The lighthouse was deactivated in 1961; as of 2014, all that remained were the foundations. The lighthouse was determined ineligible in 2011 for lack of integrity (Munson 2014).

Table 10 summarizes the detailed descriptions and photographs available on the US Coast Guard website. (That site does not provide detailed information on the Humboldt Harbor Light.)

INFRASTRUCTURE DEVELOPMENT: TRANSPORTATION, UTILITIES/COMMUNICATION, AND WATER DEVELOPMENT

These two themes are presented in this separate section because they relate to virtually all of the other themes, events, and trends that make up the history of northwestern California. They tended to be means to an end, whether that end was immigration, access to mining areas, linkages between settlements, transport of goods, or water to support all of these (and other) elements.

Transportation Systems

Transportation features and systems are critical to the development of any region: without them, people and products cannot move efficiently. Foot and pack trails, ocean and river corridors, wagon/stage roads, and railroads literally opened California up to the miners, settlers, merchants, and companies that would guide the development of the state through the end of the nineteenth century. The result was a maze of travel corridors, some of which survive today as modernized routes, while others exist only as faint linear traces…if at all.

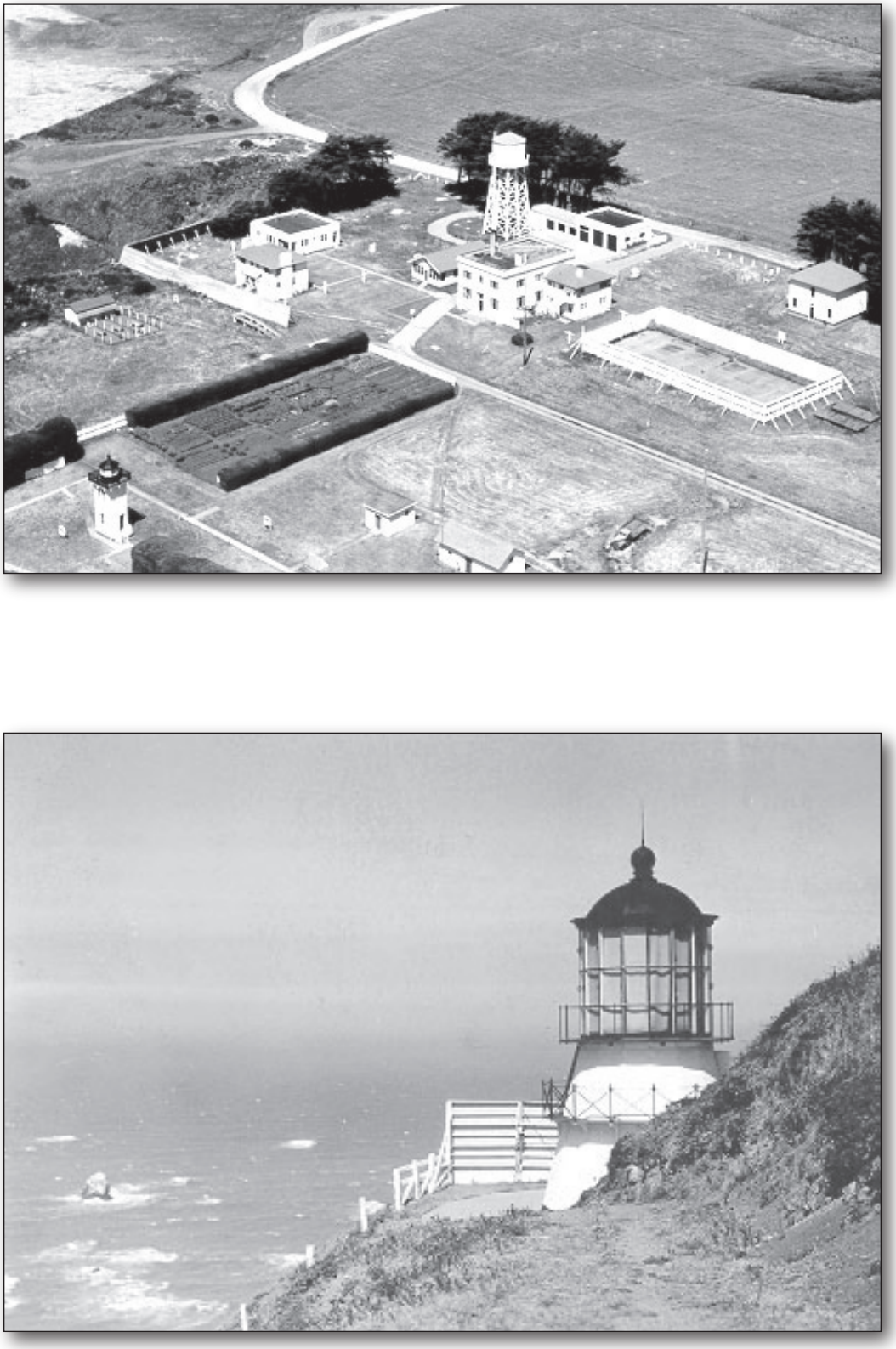

Figure 18. Table Bluff and Cape Mendocino Light Stations.

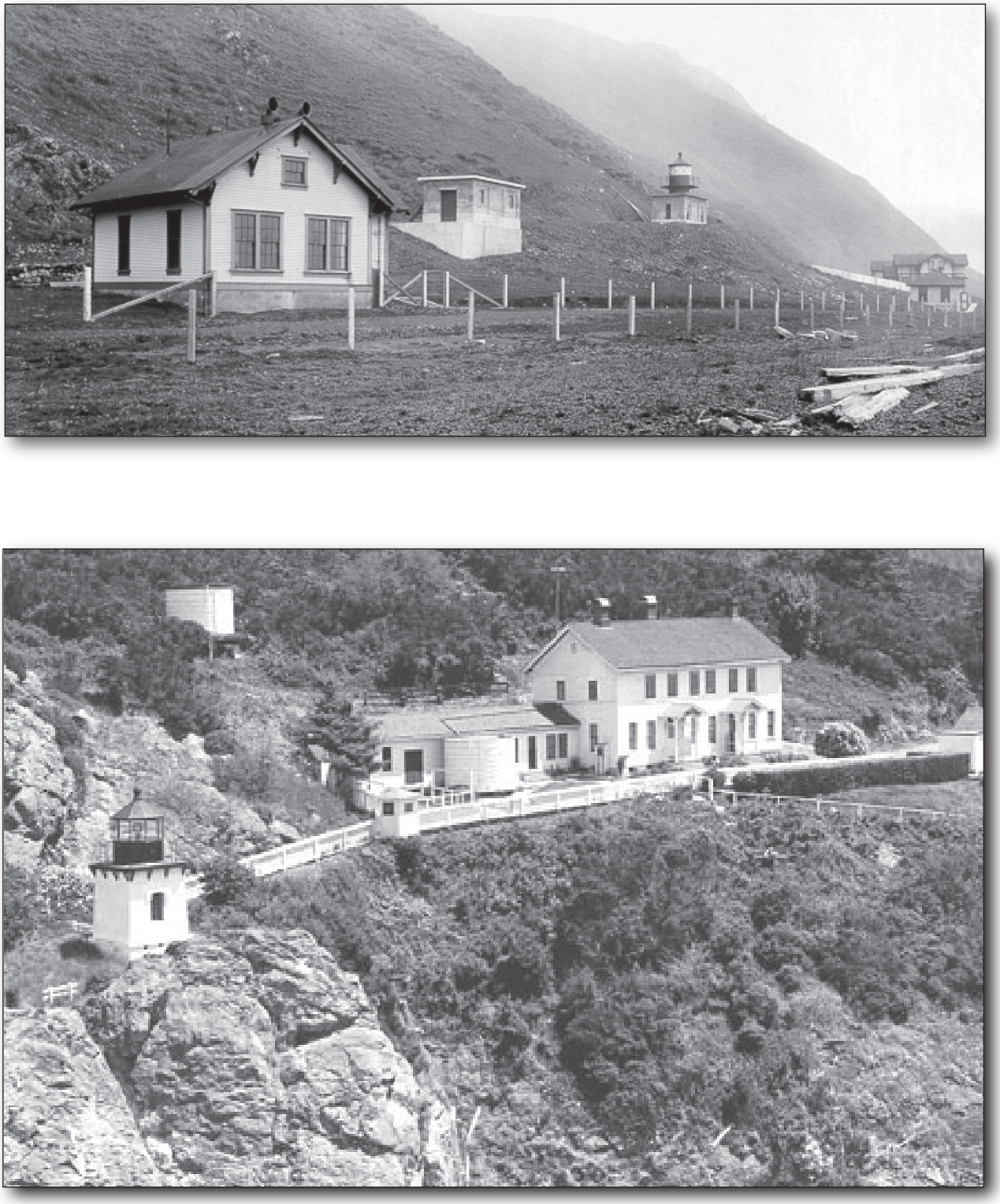

Figure 19. Punta Gorda and Trinidad Head Light Stations.

Table 10. Lights and Lighthouses on BLM-Administered Lands in the Planning Area.

Name	Original Location	Years of Operation	Materials	Tower Shape	Original Lens	Historical Notes
Humboldt Harbor Light	North Spit, Humboldt Harbor	1856–1892	Brick	Round on rectangular house	Fourth order lens	Abandoned in favor of higher lighthouse on Table Bluff. Only ruins remain.
Table Bluff Light	Table Bluff, Humboldt Bay	1892–1961	Wood	Square	Fourth order lens from Humboldt Bay relocated to Table Bluff	Replaced Humboldt Harbor Light. Only ruins remain. Sometimes called Humboldt Bay Light Station and confused with Humboldt Harbor Light Station.
Punta Gorda Light	12 mi. south of Cape Mendocino, Humboldt Co.	1911–1951	Reinforced concrete	Square	Fourth-order Bulls Eye	Included two-story lighthouse, concrete oil house, wooden fog-signal building, blacksmith/carpenter shop, three sheds, barn. Currently (2016) subject to condition assessment by BLM..
Old Cape Mendocino Light	Cape Mendocino, Humboldt Co.	1868–1970s	Concrete, cast iron	16-sided pyramidal	First-order Fresnel, moved to Humboldt Co. fairgrounds 1950	43-foot tower one of the highest in the US at 422 ft above sea level; lighthouse structure dismantled and moved to Shelter Cove in 1998.
Trinidad Head Light	Trinidad Harbor, Humboldt Co.	1866–present	Stone, brick	Square pyramidal	Fourth-order Fresnel	Originally included small two-story lighthouse, single Victorian residence, small barn, bell house. Housing and barn razed by US Coast Guard in 1960s; replica Memorial Lighthouse stands in Trinidad, with original lens.

Ocean and River Routes

The earliest of these transportation systems were the ocean routes used by European explorers and fur trappers, as described earlier. These continued to be important as shipping routes and for carrying the many thousands of gold miners who arrived at Yerba Buena (San Francisco), Eureka, and other ports on their way to the inland mines. With the exception of these ports (and later, lighthouse stations), ocean travel obviously left no archaeological remains on the landscape.

River travel soon became an important way of moving commercial goods and passengers, especially on the Sacramento. Before the era of hydraulic mining, which silted up many of the waterways between the Sierra Nevada and the San Francisco Bay, ships (and salmon) moved easily along the river to inland ports at places like New Helvetia (Sacramento), Tehama, and Reeds Creek Landing (Red Bluff; Smith 1997; Wilson 1998). Wilson reports that "From 1850 onward, freight and passengers were moved by wood[-]fired steam[-]powered paddle craft, and in later years by coal[-]fired steam, upriver as far as conditions would permit. From these river transport termini, wagon roads led on to the North" (1998:8).

Smith (1997:14) tells us that "[r]iver navigation was the lifeblood of Red Bluff in the early years," when "[t]he gold mining districts to the north desperately needed a point of supply nearer than San Francisco or Sacramento." Steamboats began arriving at Red Bluff in 1852, and the town soon became a thriving community supported in part by the river trade. The importance of river transport was reflected in the large number of ferry landings up and down the Sacramento. Smith also notes, however, that the Sacramento River was not navigable year-round "because of the dangers of snags, sand bars, and the insufficient summer depths of the river" (1997:14). During those times, people and supplies had to move by pack mule or wagon along the many trails that ran along both sides of the Sacramento River. Nevertheless, steamboats continued to "ply the waters of the Sacramento" as late as 1937 (Smith 1997:15).

Pack Trails and Wagon/Stage Roads

The many foot and pack trails, often based on Native trails, that brought the first trappers and explorers into the north state include various routes of and connectors to the Oregon-California emigrant trail.[21] There have been several archaeological and historical studies done on these early trails, among them the Yreka Trail (Sullivan et al. 2005), the Siskiyou Trail (Tveskov et al. 2001), and the Old Sacramento Trail (Ritter 2009). These trails often had various routes and were known by various names; Beaton and Wee (in Byrd et al. 2008:34–35) note the following:

> One early route, the California Trail or the Old Sacramento Trail, followed the Sacramento River and crossed the mountains north of the present site of Redding. It was used by the trapper Michel LaFramboise in 1832. A segment of the Siskiyou Trail carried Hudson's Bay trappers between Oregon and the San Francisco Bay along the west side of the Sacramento River. This route began as a trapper's trail before becoming a pack trail, wagon road and coach road…
>
> Hopeful settlers and miners poured into the study area along the California-Oregon Trail between 1840 and 1860. Once travelers reached Oregon, they had three trails to choose from to reach California, all of which passed through the upper Sacramento River Valley. The Eastern Route followed the Pit River to Cottonwood Creek and to Red Bluff. The Western Route reached Shasta from the west, and the Central Route followed the west bank of the Sacramento River through the valley.

[21] This trails is variously known as the Overland Emigrant Trail, The Overland Trail, the California-Oregon Trail, the Old Oregon Trail, and other names. It includes several California State Historical Landmark designations.

Brock (2000), Helfrich (1984), and others provide information and locations of trail markers placed by Emigrant Trails West along the Lassen, Applegate, and Nobles Trails, as well as the Truckee River and Carson River routes of the Oregon-California Trail. These and other early trails provided the main avenues of travel for emigrants entering northern California and southern Oregon in the 1840s–1860s, until the completion of the first transcontinental railroad in 1869. Many of these early trails subsequently developed into commercial or freight roads.

One early emigrant trail is a tantalizing mystery. The so-called "Lost" or "Forgotten Emigrant Trail" is mentioned in local historian Myrtle McNamar's 1952 narrative *Way Back When* (now out of print). As cited in a draft report by Deborah Tibbetts, on file at BLM's Redding office, McNamar describes the trail this way:

> …[M]any miles could be shed [from the Nobles Pass route] by following the Lassen Trail to the head of Deer Creek, thence over a new trail through the north eastern [sic] part of Tehama County, via Child's Meadows, Morgan Springs and the Mineral section to the head of South Battle Creek, thence down [the] south side of South Battle Creek Canyon to the Apple ranch on Paines (Paynes) Creek; this being almost as of Highway 36 [Tibbetts 2016:17].

Based on the results of archaeological research by BLM's Redding office in 2012 and 2015, Tibbetts theorizes that a portion of the "Forgotten Emigrant Road" is now incorporated into Spring Branch Road, running parallel to (and south of) Battle Creek.

In the early days, roads were often built by individuals who then charged toll for their use. River crossings (ferries) were also privately owned and operated; one local example is Jelly's Ferry, established in 1857 by early settler Andrew Jelly. The ferry "served stage coaches running between Sacramento and Shasta, as well as teamsters, lumber handlers from area mills, sheep drivers, and local travelers trying to reach Red Bluff. The ferry operated for nearly 100 years before it was replaced by a steel-truss bridge in 1950" (Beason and Wee in Byrd et al. 2008:32). Jelly's Ferry Road connected Shingletown, Fort Reading, Red Bluff and Shasta; a segment of the road was incorporated into the county road system in 1860. Another early ferry crossing on the Sacramento was begun by Pierson B. Reading and purchased in 1868 by William Ball, just south of Ash Creek. Ball ferried freight wagons, livestock, and stagecoaches until 1897, when a bridge was constructed nearby. Today Balls Ferry Road runs parallel to the river east of the town of Anderson.

The expanding system of wagon roads served as the main transportation routes for most of the Planning Area, later augmented (or sometimes superseded) by rail lines. Mail and passengers also traveled these early roads by stage coach. An 1866 broadside printed by the Oregon Stage Line boasted an "Overland Mail Route to California…Through in Six Days to Sacramento [from Portland]…Fare Through, Fifty Dollars" (Figure 20).[22] Today many of the early routes are overprinted by modern paved roads, for the simple fact that it was easier and less costly to improve existing roads than to build new ones.

On the North Coast, where shipping was of major importance, terrestrial transportation arteries were much slower to develop: it was not until 1876 that an overland road was constructed between Eureka in Humboldt County and Ukiah in Mendocino County. Small settlements sprang up along the route, and agricultural products (along with other goods) now moved more easily between the two areas. Smaller wagon roads were constructed to link the main route with more isolated settlements on the coast and in the interior. However, it was not until the early twentieth century that major routes (notably the Northwestern Pacific Railroad to Humboldt Bay in 1914 and the Redwood Highway in the 1920s) would open up the North Coast to the rest of California and to Oregon.

[22]From the California State Parks website at http://www.parks.ca.gov/pages/22491/files/shasta_1866%20overland%20mail%20route_oregon%20line.jpg).

OVERLAND MAIL ROUTE

TO CALIFORNIA.

Through in Six Days to Sacramento!

CONNECTING WITH THE DAILY STAGES

To all the Interior Mining Towns in Northern California and Southern Oregon.
Ticketed through from PORTLAND, by the

OREGON LINE OF STAGE COACHES!

And the Rail Road from Oroville to Sacramento,

Passing through Oregon City, Salem, Albany, Corvallis, Eugene City, Oakland, Winchester, Roseburg, Canyonville, Jacksonville, and in California— Yreka, Trinity Centre, Shasta, Red Bluff, Tehama, Chico, Oroville, Marysville to SACRAMENTO.

TRAVELERS AVOID RISK of OCEAN TRAVEL

Pass through the HEART OF OREGON—the Valleys of Rogue River, Umpqua and Willamette.

This portion of the Pacific Slope embraces the most BEAUTIFUL and attractive, as well as some of the most BOLD, GRAND and PICTUERESQUE SCENERY on the Continent. The highest snow-capped mountains, (Mt. HOOD, Mt. SHASTA and others,) deepest ravines and most beautiful valleys.

Stages stop over one night at JACKSONVILLE and YREKA, for passengers to rest. Passengers will be permitted to lay over at any point, and resume their seats at pleasure, any time within one month.

FARE THROUGH, FIFTY DOLLARS.

Ticket Office at Arrigoni's Hotel, Portland.

H. W. CORBETT & Co.,

PORTLAND, July 19, 1866. Proprietors Oregon Stage Line.

W. D. Carter, Printer, Front St., Portland, Oregon.

Figure 20. Shasta Overland Mail Route Broadside.

The development of terrestrial transportation systems was vital to the rugged and remote inland regions as well. For the first two decades after the gold discoveries, people and supplies had to travel along slow and circuitous routes on foot or using pack trains, river boats, and wagons. In 1871, a 105-mile-long wagon road was opened to connect Yreka—a "center of commerce in the northern interior of California" (Beckham 2006:114)—to Fort Klamath in southern Oregon. The Topsy Road, as it was known, was a primary freight route through the region for three decades, and by 1900 several stage stops had been established: Ager, Bloomingcamp, Beswick, and State Line Ranch in California; and Way Station/Ranch, Topsy, and Chase Station in Oregon. A 2,500-foot-long segment of Topsy Road has been recorded under the BLM site number CA-030-2027. (There are no way stations in the site record database; presumably these have not been formally recorded.)

Another important early route in the Planning Area was the Shasta-Yreka Road/Turnpike (CA-030-0187/SHA-2806H), a "historic Gold Rush and post-Gold Rush road system [that] stretched for about 100 miles, linking the old historic mining towns of Shasta and Yreka" (Woodrum 2009a:2). The feature has been determined eligible for listing on the National Register (Ritter 2009). In her historical overview of the road, Woodrum notes that, "[i]n the early days of settlement in Shasta County…the town of Shasta was geographically isolated from northern destinations by rough terrain, hostile Indians, winter snow and spring flood, and a paucity of roads to other major settlements…" (2009a:2). In the early 1850s, it was "four or five days of hard travel" to cover the 100 miles from Shasta to Yreka. Nevertheless, period newspapers "chronicled a steady flow of mule packers, settlers, gold seekers, traders and merchants, and other travelers" between the two county seats (Woodrum 2009a:3). The road segment recorded as CA-030-0187/SHA-2806H appears to have been part of a stage route from Shasta that connected to the Oregon-California Trail on its way to Yreka (Woodrum 2009a13).

The Middle Creek Road (CA-030-1079; SHA-2667H) was constructed by the citizens of Shasta in the early 1880s to connect the town with the new California & Oregon Railroad line along the Sacramento River (Woodrum 2011). The road was an attempt by the citizens to make up for the fact that the railroad had bypassed their town. It partly followed the "road to Red Bluff" and then turned northeast to parallel the north bank of Middle Creek (Woodrum 2011:48). Woodrum also notes that portions of the road have been obliterated by Highway 299 West and Iron Mountain Road. Even so, Ritter (2011) identified intact segments with a variety of artifacts: horse and mule shoes, tack, wagon parts, rock retaining walls, and even personal items.

Table 11, while certainly not exhaustive, lists many of the more important trails and wagon roads in the Planning Area, and all roads that appear in the BLM site database. Route names changed over time, and often the same route was given more than one name; names used on the table are taken from reports and site records provided by BLM. The "Earliest Known Date" listed on the table is also somewhat arbitrary in many cases, as trails often developed into wagon roads over time, with no clear-cut date of "construction." In other cases the dates indicate the earliest known map showing the route. Many other early (unnamed) routes were also used to connect mining areas, ranches, and towns, but it is not feasible to identify them all.

Public Railroads

As we have noted, lumber companies built the first railroads in northern California, beginning in the early 1850s; the logging railroads in Humboldt County appear to have been the first. But these systems were limited to the transport of work crews and lumber for specific companies. The first true passenger and freight lines open to public travel were slower in coming:

Table 11. Major Historic-Era Trails and Wagon Roads in the Planning Area.

NAME	BLM OR PRIMARY NO.	REGION(S)	EARLIEST KNOWN DATE	NOTES/OTHER DESIGNATIONS	REFERENCES
Shasta-Yreka Road/Turnpike	CA-030-0187	Upper Klamath/ Sacramento Valley	pre-1860	Sometimes labeled as a branch of the Old Sacramento River Road and Oregon-California Trail.	Ritter (2009)
Humboldt Wagon Road	CA-030-0272	Upper Sacramento Valley/ Southern Cascades/ Sierra Nevada Foothills	1863	Chico & Humboldt Wagon Road; road houses built at Ten Mile House, Fourteen Mile House, Forest Ranch.	BLM site record
Old Shasta Road	CA-030-0551	Upper Sacramento Valley	ca. 1851	Shasta Wagon Road, Redding & Shasta Wagon Road; Highway 299W	Woodrum (2011)
Shasta to Red Bluff Road	CA-030-0576	Upper Sacramento Valley	1851	Red Bluff Road; connected Shasta to Middletown, Horsetown, Cottonwood, and Red Bluff	Woodrum (2011); BLM site record
Balls Ferry/Shingletown/ Ft. Reading Road Complex	CA-030-0635	Upper Sacramento Valley/ Southern Cascade Foothills	1861	-	BLM site record
Haight Brothers Cattle Trail	CA-030-0710	Upper Klamath	1860s	Haight Brothers Road, Martin's Trail	BLM site record
Yreka Trail	CA-030-0878	Upper Klamath	1833	South Emigrant Trail, Siskiyou Trail, Pitt River Road; reportedly traveled by early trapper and explorer John Work	Sullivan et al. (2005); BLM site record
Pitts River Road	CA-030-0879	Upper Klamath	1850s	Yreka-Fall City Road	BLM site record
Middle Creek Road	CA-030-1079	Upper Sacramento Valley	1884	-	Ritter (2011)
Bull Hill Road	CA-030-1121	Southern Cascades/ Sierra Nevada Foothills	1872	-	BLM site record
Jelly to Inks Creek Road	CA-030-1149	Upper Sacramento Valley	1857	-	BLM site record; Byrd et al. (2008)
Road to Junction City	CA-030-1181	Upper Sacramento Valley and Klamath Mtns/High No. Coast Ranges	1882	Main road from Weaverville to Junction City	BLM site record; Colby (1982)
Democrat Gulch Road	CA-030-1190	Upper Sacramento Valley and Klamath Mtns/High No. Coast Ranges	1911	-	BLM site record
Whitmore's Road	CA-030-1197	Klamath Mtns/High North Coast Ranges	1881	-	BLM site record

Table 11. Major Historic-Era Trails and Wagon Roads in the Planning Area *continued*.

NAME	BLM OR PRIMARY NO.	REGION(S)	EARLIEST KNOWN DATE	NOTES/OTHER DESIGNATIONS	REFERENCES
Road from Weaverville to Steiner Flat	CA-030-1224	Upper Sacramento Valley and Klamath Mtns/High No. Coast Ranges	1913	-	BLM site record
Stony Gulch Road	CA-030-1234	Upper Sacramento Valley	-	-	BLM site record
Lewiston Turnpike	CA-030-1236	Upper Sacramento Valley and Klamath Mtns/High No. Coast Ranges	1858	Tower House to Weaverville	-
Turtle Creek Road	CA-030-1297	Southern Cascade Foothills	-	-	BLM site record
Benson Mine Road	CA-030-1347	Upper Sacramento Valley	1920s	-	BLM site record
Road to Old Shasta	CA-030-1399	Upper Sacramento Valley	1853	Wagon road between Old Shasta and nearby mining areas; segment of Sacramento River Road	BLM site record
Upper Coram Road	CA-030-1407	Upper Sacramento Valley	-	-	BLM site record
Southeast Eastman Sled Road	CA-030-1492	Klamath Mtns/High North Coast Ranges	-	-	BLM site record
Old Highway 299	CA-030-1498	Upper Sacramento Valley	-	Abandoned segments	BLM site record
East Fork Road	CA-030-1513	Upper Sacramento Valley	-	-	BLM site record
Coram Road North	CA-030-1720	Upper Sacramento Valley	-	-	BLM site record
Copley Trail	CA-030-1722	Upper Sacramento Valley	1884	Pack and foot trail, later used to access copper mines in the mountains northwest of Keswick	BLM site record
Texas Location Road	CA-030-1762	Upper Sacramento Valley	-	-	BLM site record
Belle Mill Road	CA-030-1864	Southern Cascade Foothills	pre-1860	Hogback Road	Woodrum (2009b); BLM site record
Camden Toll Road	CA-030-1891	Upper Sacramento Valley	1852/1861[a]	Created from a 1849 packer's trail; partly overprinted by Old State Highway/ Highway 299W	Colby (1982); Smith (2008); Woodrum (2011)
Denny Historic Road	CA-030-1973	Southern Cascade Foothills	-	Possible segment of Tehama Wagon Road	BLM site record
Shasta-Weaverville Road	CA-030-1986	Upper Sacramento Valley and Klamath Mtns/High No. Coast Ranges	1857–1858	Buckhorn Toll Road, Lowden's Toll Road; mostly overprinted by State Route 20	BLM site record

Table 11. Major Historic-Era Trails and Wagon Roads in the Planning Area *continued*.

NAME	BLM OR PRIMARY NO.	REGION(S)	EARLIEST KNOWN DATE	NOTES/OTHER DESIGNATIONS	REFERENCES
Ponderosa Way	CA-030-1987	Sierra Nevada	1933–1935	Ponderosa Truck Trail, built as a fuelbreak by CCC enrollees	BLM site record
Topsy Road	CA-030-2027	Upper Klamath	1871	Topsy Grade, Topsy Wagon Road; section of Yreka-Fort Klamath Wagon Road	BLM (2003); Newland and Walker (2015)
Utah Construction Company Road; OR-A156H	P-04-002548	Sierra Nevada	-	-	BLM site record
Fort Gaston Trail	P-12-001191	Coast Ranges	1850?	Arcata to Hoopa Trail	BLM site record
Tan Bark Road	P-23-003299	Coast Ranges	Late 1880s	Old Government Trail	BLM site record
North Fork Trail	P-53-001766	Klamath Mountains/High North Coast Range	1850s?	"One of the earliest historic routes in Trinity County"; replaced by Hobo Gulch Rd. in 1930s	BLM site record
Oregon-California Trail	-	All except North Coast	1840s	California Trail, Overland Emigrant Trail, California Historical Landmark #799	NPS (2015); OCTA (2016); Wilson (1998)
Beckwourth Trail	-	Sierra Nevada	1851	Sparks, NV to Marysville, CA	Hammond and Hammond (1994); Morgan and Mitchell (2011)
Lassen Trail	-	Southern Cascades/ Upper Sacramento Valley	1848	Lassen Cut-Off	Colby (1982)
Nobles Trail	-	Southern Cascades/ Upper Sacramento Valley	1852	Overprinted by portions of Highway 44	Lassen County Office of Education; Colby (1982); Vaughan (1994)
Siskiyou Trail	-	Upper Klamath	1840s–1850s	Portion of Oregon-California Trail	Tveskov et al. (2001)
Crescent City to Trinidad Wagon Road	-	Coast Ranges	1894	First north-south road on the northern California coastline	Bearss (1969); Redwood National Park site record database
Lockhart Wagon Road	-	Upper Klamath/ Sacramento Valley	1855	Yreka to Red Bluff section of old emigrant trail	Colby (1982)
Yreka Road	-	Upper Klamath/ Sacramento Valley	1859	Trinity Road	Woodrum (2009a)
Old Sacramento Road	-	Upper Klamath/ Sacramento Valley	1861	Lower Soda Springs and Pit River Road, Red Bluff-Yreka Road	Woodrum (2009a)

Table 11. Major Historic-Era Trails and Wagon Roads in the Planning Area *continued*.

NAME	BLM OR PRIMARY NO.	REGION(S)	EARLIEST KNOWN DATE	NOTES/OTHER DESIGNATIONS	REFERENCES
Sacramento River Trail	-	Upper Klamath/ Sacramento Valley	1830s	Early trail first mapped by Hudson's Bay Co. trappers	Woodrum (2009a)
Marysville-Shasta Road	-	Upper Sacramento Valley	1849	Early stage road accessing Bidwell's ranch	White (2015)
Flat Creek Road	-	Upper Sacramento Valley	1861	West bank of Sacramento River from Waugh's Ferry to Spring Creek	Woodrum (2009a, 2011)
"Lost/Forgotten Emigrant Trail"	-	Upper Sacramento Valley	1872	Spring Branch Road? State Route 36	Ritter personal communication, (2016); McNamar (1952; in Tibbetts 2016 draft)
Waugh's Ferry Road	-	Upper Sacramento Valley	pre-1884	Led east from near the town of Shasta, crossing the river at Waugh's Ferry	Woodrum (2011)
Tehama County Wagon Road	-	Upper Sacramento Valley	1863	Part of "Forgotten Emigrant Trail"?	Tibbetts (2016 draft)
Buckhorn Toll Road	-	Upper Sacramento Valley and Klamath Mtns/High No. Coast Ranges	1907	Alternate route to Weaverville	Colby (1982)
Powellton/Humbug Road	-	-	-	-	-

Note: [a] Colby (1982) and Woodrum (2011) state that this road was constructed/finished by Charles Camden in 1861; Smith (2008), however, reports that it was built by Levi Tower in 1852 and purchased by Charles Camden in 1861.

> …[O]nly a few local railroads began to serve central California's mining areas, where stage company operations soon displayed transportation superiority to those of any other state. Excellent Concord stage coaches could be transported to California about as easily as mud wagons that offered more common services in other states. But heavy locomotives and iron for railroads and their tracks could be imported only with great difficulty. So attention focused almost entirely upon California demands for a transcontinental railroad that would make local lines practical as well [Robertson 1998:5].

Once the transcontinental railroad arrived, those "local lines" began to proliferate: as of June 30, 1876, California already had 18 standard-gauge and nine narrow-gauge railroads (Robertson 1998:17). At first, these were concentrated in the more heavily populated areas of southern California, the San Francisco Bay Area, and the Central Valley. Table 12 lists the historic systems operating in the Planning Area.

Orsi (2005) provides an extremely detailed discussion of the history of the Southern Pacific, one of the largest and most important railroads in the American West. Over a period of 80 years, the Southern Pacific would gradually purchase, consolidate, and expand many predecessor lines (including the Central Pacific) in the West and Southwest. By the 1920s, the company had constructed or purchased mainlines up and down the length of California, including the Northwestern Pacific from San Francisco to Humboldt Bay (completed in 1914) and a line from Marysville to Redding that on 1874 maps is labeled as the Oregon Division of the Central Pacific Railroad.

Southern Pacific also had a hand in other aspects of California's growth. The "Big Four" who owned the Southern Pacific Railroad adhered to the "Homestead Principal," which posited that public lands in the West should be used to encourage small-farm settlement. Shortly after he was elected governor of California, Leland Stanford "agitated on behalf of setters' rights to public lands" (Orsi 2005:58). His support helped to influence the US Congress to pass the Homestead Act of 1862. The company was also instrumental in the outlawing of hydraulic mining in California, in support of the farmers and ranchers who shipped their produce and livestock on the railroad—and whose prosperity had a direct impact on the railroad's success (Orsi 2005:54–55). Ironically, Southern Pacific used this same destructive technology a few years later, "to speed and reduce the cost of constructing its Siskiyou line connecting the state to Oregon" (Orsi 2005:210). The Siskiyou line, opened in 1887, ran for 95 miles between the towns of Ashland and Weed. Today it operates as the Central Oregon & Pacific Railroad, between Weed and Eugene.

Historic railroads in the Planning Area site database include the Magalia and Skyway segments of the Butte County Railway (CA-030-0885 and CA-030-0886), a segment of the Feather Falls Railway through Oregon Gulch (CA-030-1348), and the Shasta Segment of the Sacramento River Railroad/Oregon & California Railroad (CA-030-1763).

Utilities/Communication

The first electrified communication system in California was the telegraph. The first lines were constructed by small local companies beginning in 1853, to connect towns within the state. Soon there were several eastern companies vying with each other to build lines across the country and connect with the West. In 1860 the US Congress passed the Pacific Telegraph Act, authorizing the Secretary of the Treasury to accept bids for construction of a transcontinental line. The Western Union Telegraph Company won by default when the other bidders dropped out.

In California, Western Union consolidated the small local companies into the California State Telegraph Company, and construction began on an interstate line. By 1861 "isolated California, whose

Table 12. Historic Railroads in the Planning Area (adapted from Robertson 1998, with additions).

NAME[a]	DATES OF OPERATION	TYPE	NOTES
Arcata & Mad River Railroad Company	1881–1983	Common carrier, lumber	-
Bucksport & Elk River Railroad/Railway Co.	1885–1953	Common carrier, lumber	Name changed in 1932
Butte & Plumas Railway Co.	1901–1940	Logging	-
Butte County Railroad Co.	1903–1915	Common carrier, lumber	-
California & Northern Railway Co.	1901–1904	Common carrier, lumber	Sold to San Francisco & Northwestern Railway Co. in 1904
California & Oregon Railroad Co.	1869–1870	Common carrier, mining, agriculture	Operated for only a few months before being consolidated into the CPRR in 1870
California Redwood Co.	1883–1901	Logging	-
California, Shasta, & Eastern Railway Co.	1913–1926	Common carrier, lumber	-
Central Pacific Railroad (CPRR)	1899–1959	Common carrier	Existed both earlier and later under different names
Colusa & Hamilton Railroad Co.	1913–1917	Common carrier, agriculture	-
Eel River & Eureka Railroad Co.	1884–1903	Common carrier, logging	-
Feather River Railway Co.	1940–1966	Common carrier, lumber	-
Fruit Growers Supply Co.	1913–1953	Logging	-
Glen Blair Redwood Co.	1903–1928	Logging	-
Humboldt Northern Railway Co.	1905–1958	Logging	-
Iron Mountain Railway Co.	1896–1924	Common carrier, mining	-
Klamath Lake Railroad Co.	1903–1913	Common carrier, lumber	-
Long-Bell Lumber Co.	1926–1955	Logging	-
McLoud River Railroad Co.	1897–1992	Common carrier, logging	Still operating (as of 1998) as McLoud Railway Co.
Northern California Railway Co.	1860–1898	Common carrier	Began as California Northern Railroad Co. in 1860; consolidated into Southern Pacific Railroad 1898
Northern Redwood Lumber Co.	1903–1956	Logging	Widened to standard gauge in 1925
Northwest Pacific Railroad Co.	1888–1992	Common carrier, lumber	Began as San Francisco & North Pacific Railway Co., became Northwest Pacific Railroad in 1907; merged with SPRR in 1992

Table 12. Historic Railroads in the Planning Area (adapted from Robertson 1998, with additions) *continued*.

NAME[a]	DATES OF OPERATION	TYPE	NOTES
Oregon & Eureka Railroad Co.	1875–1911	Lumber	Oregon & Eureka Railroad Co. (began as Humboldt & Mad River Railroad in 1875, then Humboldt Bay & Trinidad Railroad, then Eureka & Klamath River Railroad; merged into Northwestern Pacific Railroad in 1911)
Pacific Lumber Co.	1869–1977	Common carrier, logging	-
Sacramento Northern Railway	1889–1987	Common carrier	Began as Marysville & Yuba Street Railroad Co. in 1889, went through many different reorganizations—Shasta Southern, Northern Electric, etc.—became Sacramento Northern Railway in 1921, operated until 1987 and then merged into UPRailroad
Sierra Lumber Co.	1875–1907	Logging	Began as Sierra Flume & Lumber Co.
Yreka Western Railroad Co.	1888-	Common carrier, mining, lumber	Began as Yreka Railroad Co., still in operation as of 1995

Note: [a] Railroad lines changed names often as new corporations were formed and one line merged with another (see Notes).

only means of communication with the outside, hitherto, had been the slow, hazardous journey over the plains, across the Isthmus or around the Horn, was in close communication with the eastern coast" (Bates 1914:181). Bates reports several "amusing incidents" as the public encountered the new system:

> Some curious spectators thought that the messages were being carried over the wire and tried to catch glimpses of them as they were being carried along. Others believed the wire was hollow and the messages were being carried by an enchanted spirit. The Indians saw that the poles made a cross and conceived the idea that the Yankees were fencing in the country with crosses to keep the devil out [1914:182–183]

In 1866 Western Union purchased a controlling interest in the California State Telegraph Company, and all of the lines in California became part of Western Union's Pacific Division. "Lines were extended in every direction following the railroad, and it was not long before the state became a net-work of telegraph lines" (Bates 1914:185). Western Union dominated the industry from the 1860s onward, using the railroads to establish their lines. A mutual relationship developed, as railroad companies provided a "protected" route for telegraph lines and offices. In turn, Western Union provided free messaging to promote safe travel and avoid collisions (Lindström et al. 2007:67). The relationship was sometimes a rocky one, however, as telegraph and railway companies fought over such issues as the definition and use of "public domain" versus private property. As the twentieth century began, more and more railroads began to construct their own lines. As telephones became more popular, small companies began to construction their own systems to replace the earlier telegraph lines.

The US Forest Service began installing telephone lines in the western forests in 1910. Coats (ca. 1978) describes these early systems as "single-wire grounded circuit" lines strung between trees, to serve rangers, logging operators, local residents, and "fire control cooperators." In the 1930s and early 1940s, the CCC constructed two-wire lines on federal lands, but by the 1950s, most of the telephone lines had been torn down or sold to private companies. Today they are sometimes visible as small white porcelain insulators embedded in trees, some with segments of heavy-gauge wire still attached.

Only a few communications lines have been recorded on BLM lands in the Planning Area. Quite often old lines have been upgraded and modernized, and are not easily recognizable as historic features except where they are depicted on old maps. Among the known historic lines are the "Weaver Road and telegraph line" recorded as site CA-030-1336; a segment of the Paynes Creek Telephone Line (CA-030-0368); an "older telephone line" running along Forbestown Road (CA-030-1929); and portions of two other (unnamed) lines recorded as CA-030-0842 and CA-030-0952.

Water Development

The site record database for the planning area (see *Part II*) includes 173 sites with water-related features or components. Of these, more than 71% appear to be related to mining, and nearly all of those are ditches. The remainder include water-supply features tied to residences or settlements, dams or culverts along old roadways, logging flumes/chutes, and at least one ditch that supplied water for hydroelectric power.

Water for Mining

Essentially every type of mining requires some amount of water, for washing, sluicing, booming, cooling, or supplying the hydraulic monitors (see *The Technology of Gold Mining*, page 132). Placer mining, by definition, involved an on-site water supply, but most other methods required that water be transported via ditches, flumes, and pipelines. In particular, hydraulic mining used vast amounts of water to expose the ancient gold-bearing gravels and wash them down into the sluices. This water had to

be delivered at high "head" (pressure), which often meant storing it in reservoirs from which it could be released all at once and gravity-fed down to the monitors. Coleman (1952:94) estimated that, "at the zenith of hydraulic mining," the total combined length of mining ditches in the California gold regions "had reached 8,000 miles." These water-supply systems are represented today by many miles of ditches (some abandoned, others repurposed), collapsed flumes, and small dams/reservoirs.

Water for Settlement/Agriculture

The first non-native settlers built their homes and towns along rivers and streams, or at active springs. As the populations grew, however, and needed more water for both human consumption and for farms and ranches, more-distance sources had to be tapped. Wells were drilled, springs were developed, and water was transported through ditch/flume systems and pipelines—often abandoned mining features. It is difficult in many cases to determine the exact origins of these ditches (mining, agriculture, other), particularly those that have been modified for re-use. Larger systems often appear on period maps, but smaller ones usually do not. The attributions of these ditches typically are based on associations with other types of features, or on historic-era maps that depict the systems.

Water for Logging

Logging in the nineteenth and early twentieth centuries often involved wooden flumes and chutes that delivered the lumber from the mountain mills, downslope to where they could be floated down a river or loaded onto waiting wagons or rail cars. Remnants of these features, either three-sided box flumes or two-sided "V"-flumes, are sometimes found on the landscape, along with deep, wide linear earthen channels or stacked-rock support features. Large mill ponds are sometimes found as well, where the logs were stored while awaiting the saw. Very few logging-related water features have been identified and recorded in the Project Area; those that have include the Empire Flume (one section recorded as BLM site CA-030-0474) and the Blue Ridge Flume, sections of which have been recorded under various site numbers. Both of these systems were constructed in the Shasta/Tehama area in the early 1870s. Smith (1992:3) reproduces Hutchinson's (1956) map of major lumber flume systems feeding down to the Sacramento River near Red Bluff and Los Molinos, and down Big Chico Creek to the town of Chico.

Water for Hydroelectric Power

The water systems built by miners and (to a lesser degree) loggers would propel northern California to the forefront of water-powered generation of electricity. As Clark (1970:2) has noted, "a number of the old ditches, flumes, and reservoirs that once supplied water to the hydraulic mines now are parts of hydroelectric and irrigation systems" of California. Another mining invention would also become important to the hydroelectric industry: "The prime mover most widely applied in California" was the "Pelton or free jet tangential impulse wheel" (Reynolds and Scott 1980:7).

These systems, coupled with the steep mountain topography, made hydroelectricity an obvious choice for the state. The waters of the Sierra, for example, fall quite steeply down the west slope, making it possible "to build not one but sometimes as many as six generating plants on one stream" (Coleman 1952:92). The Coast Ranges, on the other hand, have relatively flat gradients and erratic streamflow, making hydroelectric power generation much more difficult [Reynolds and Scott 1980:8). Electrical power for coastal towns like Eureka was provided by steam-powered generators as recently as the 1950s (Coleman 1952).

The Sierran plants would produce "energy that was to transform arid and semiarid lands into bountiful sources of agricultural wealth" and "give to industry and commerce the means of production in regions where the high cost of coal fuel had retarded growth" (Coleman 1952:102). By 1900, California

had 25 hydroelectric plants, including the Yreka plant, built in 1895, and Centerville, built in 1898 (Reynolds and Scott 1980:16). By 1910, both Redding and Red Bluff had small electric lighting plants.

One important early system was built on Battle Creek and its tributaries, on the line between Shasta and Tehama counties. Its first plant, Volta, was constructed in 1901 (Reynolds and Scott 1980; also see Kellawan 2012). Additional plants would include South (1910), Inskip (1910), and Coleman (1911). Spurred by the dramatic increase in copper mining in the Shasta District around 1890–1900, the Battle Creek system was built by the Keswick Power Company (subsequently renamed the Northern California Power Company) to supply cheap energy to the Shasta mines and smelters. It continues in operation today, with many upgrades, by the Pacific Gas & Electric Company, providing hydroelectric power to portions of northern California.

The earliest operations lacked the ability to transmit power over great distances and were typically small operations that generated power for local areas. Later developments in power transmission would greatly expand the industry, and are reflected in the many power lines that crisscross California today. In addition to these lines, archaeological features associated with hydroelectric power in the Planning Area include the Miocene Canal and flume (CA-030-0191), built during the Gold rush and later converted for power generation; the Table Mountain Hydroelectric Dam test adit (CA-030-1146), possibly constructed to test bedrock integrity in preparation for the proposed Iron Canyon Dam; the "alleged" South Battle Creek hydroelectric construction camp (CA-030-1947); and the Upper and Lower Centerville Canal (CA-030-1765), built in 1875–1907 between the Centerville Head Dam and the Centerville Powerhouse.

THE NEW CENTURY

The first half of the twentieth century was perhaps the most extreme period of cultural, political, and economic upheaval in US history: two world wars, a great economic depression, widespread epidemics of polio and influenza, a failed experiment in the prohibition of alcohol that triggered the rise of organized crime, and a successful movement to finally give women the right to vote. In northwestern California, national and global events would lead to a major shift in the economy, particularly associated with mining.

Mining in the Twentieth Century

The first decades of the twentieth century saw a continuation of mining as a major economic force in the Planning Area, particularly in Shasta, Trinity, and Butte cCounties. At the turn-of-the-century, the first successful bucket-line dredging began on the lower Feather River near Oroville: "Gold dredging soon became a major industry that continued for more than 65 years" (Clark 1970:7). Major advances were made in lode mining, as well:

> These changes enabled many more lode deposits, especially large but low-grade accumulations, to be profitably worked. The improvement of air drills, explosives, and pumps, and the introduction of electric power lowered mining costs greatly. The introduction of rock crushers, increase in size of stamp mills, and new concentrating devices, such as vanners, lowered milling costs. Cyanidation was introduced in 1896 and soon replaced the chlorination processes [Clark 1970:7].

Clark also tells us that "[t]he lost, high-grade Tightner vein was rediscovered at Alleghany in Sierra County" in 1904, causing a revival of gold mining in the Alleghany district that continued until 1965; he also reports that Alleghany was "the last district in the state where gold mining was the chief industry" (1970:7). World War I caused a decrease in gold production (though it also triggered a boom in the mining of copper and other important metals). Gold mining then went through a hiatus, only to be revived once again by the stock market crash in 1929.

The Great Depression

It was during the Great Depression that a large number of mining claims in northwestern California were taken up, when many unemployed miners and other workers returned to abandoned mine sites and dredger operations to eke out a living. Clark (1970:xi) says that "[d]uring the depression years of the 1930s, gold output in the state was nearly as high as it had been during the gold rush." Vaughan (1994:12) states that "20,000 depression[-era] miners came to the mountains throughout California, attempting to eke out a living…" and leading to "serious social problems" in the rural areas whose populations suddenly swelled by as much as 200%. Miller (1998) provides a public-level narrative of the daily lives of the Depression-era miners on the "Western mining frontier," as well as the political and economic climate of the times.

Unlike the Gold Rush, however, the 1930s claims were worked not just by male miners, but by families who saw an opportunity to survive by making a living reworking the placers of the nineteenth-century miners. Building cabins and homes in the hydraulicked and placered-out areas, they also planted orchards and gardens and raised livestock to supplement their mining activities. These Depression-era mining sites are often marked by abandoned orchard trees, household refuse, and 1920s–1930s-era artifacts. Several sites from this era have been recorded in the Planning Area, though additional research will be needed to connect them with twentieth-century mining. One example with both Depression-era artifacts and mining remains is the Ryan Site (SHA-2430/H/CA-030-0433) on Olney Creek, just northwest of Redding. Another is SHA-2399/H/CA-030-0520, the subject of Ritter et al.'s (2014) investigations of a small, rural hamlet in Rattlesnake Gulch, just southwest of Redding. The archaeology and history of this multi-ethnic "neighborhood" of miners, farmers, and their households provide an intimate look at the social and economic lifeways of the larger Redding vicinity during the first deaces of the twentieth century.

The new influx of miners created more competition for local jobs, strains on county services, and issues for federal land managers. According to Winthrop and Chambers, about a third of these small claims were located on public lands managed by the US Forest Service (1988:13); many more were located on lands administered by the BLM. The 1930s brought other far-reaching changes to the mountainous areas of northwestern California, as well. Many mills were closed as timber markets dwindled. By 1935 the railroads had been essentially replaced by trucks as transport for the struggling timber industry. Much of the abandoned timber lands were acquired by the Forest Service, which still manages these lands today.

In addition to the these small claims, federal lands also became prime locations for "hobo camps" and "Hoovervilles"—family camps set up by those seeking employment in the construction of dams and other federal work projects, and those who simply could not afford to live anywhere else. Some of these homes were built by workers who stayed on after the construction projects were completed. BLM razed a number of these houses in Shasta County in the 1960s, but foundations and cultivars still remain (Rocca 1993, 1995; Ritter, personal communication, September 2016).

Despite these hardships, northwestern California fared relatively well during the economic hard times between the two World Wars. In their study of the Depression era in western Siskiyou County, for example, Winthrop and Chambers (1988:1) attribute the survival of such rural areas to "a stable and enduring self-sufficient economy" somewhat removed from the larger cash economy, and to the continued dependence on gold mining (and, according to oral histories collected by the Klamath National Forest, on various other enterprises: "[o]thers engaged in bootlegging; there were lots of stills throughout the mountains, and the law often looked the other way" [Vaughan 1994:16]). Many others found part-time work as Forest Service fire-fighters, or joined the Civilian Conservation Corps.

The interviews with long-time local residents smack more of nostalgia than of deprivation, as the interviewees recalled a simpler time when being poor was just "a way of life." Loneliness and fear, which Winthrop and Chambers call "two national themes of the Depression Era," seem to have been less

prevalent in these more self-sufficient regions than elsewhere in the country. Those "national themes" would be all but forgotten, however, when America found itself drawn into another world war.

Wartime Activities

The First and Second World Wars affected northern California in a number of ways. During World War I, enlistments were not particularly high: military records in the National Archives indicate that there were 157 draft rolls in the state during World War I, of which only 13 were for counties in the Planning Area, compared to 37 just in the city of Los Angeles. [23] Even so, many of the local men had special skills that made them particularly desirable. The July 13, 1917 issue of the *Red Bluff Daily News* ran this article (reproduced in part):

> FORESTRY REGIMENT TO FRANCE ABOUT READY TO ASSEMBLE IN SAN FRANCISCO…Fifty more loggers and lumber men are needed at once from California. Men applying immediately to the district forester's office, San Francisco, either in person or by letter, or to forest supervisors at Los Angeles, Oriental, Escondido, Placerville, Bishop, Yreka, Red Bluff, Alturas, King City, Quincy, Santa Barbara, Bakersfield, Sisson, Northfork, Sonora, Nevada City, Weaverville, Calif., and Gardnerville, Nevada, have a splendid chance of being enlisted for immediate service in the French forests. Woodsmen who are skillful choppers, fellers, buckers, swampers, cordwood cutters, log loaders, log rollers, carriage men and teamsters are the classes wanted…The regiment will convert available timber behind the battle lines in France into railroad ties, trench timbers, mine props, bridge timbers, lumber, and cordwood needed in the military operations of the British Army.

In addition to men with forestry skills, Planning Area counties offered important metal and mineral deposits. While many of the gold mines saw decreased activity during the war, or were shut down entirely, the copper belts of Shasta and Butte Counties experienced a boom period (Clark 1970). However, only one resource in the BLM database can be tied definitively to the era of the First World War: the Humboldt Bay lifesaving station (Coast Guard Station Humboldt Bay), built in 1936 to replace an older station, "figured prominently" in the rescue of "the 27-man crew of the Navy submarine H-3 on December 14, 1916," and the "safe removal of 421 enlisted men and 17 officers from the doomed USS Milwaukee on January 12, 1917" (Van Kirk 1977:3).

A few more sites can be linked to World War II. By the time the US entered the war in 1942, long-range submarines and bombers had changed the face of war and increased the chances of attack on the American mainland—particularly along the coastlines. Coastal areas of California, Oregon, and Washington were thought to be particularly vulnerable to enemy attack:

> Soldiers from west coast Army posts…were rushed to various points along the coast to prepare defenses against an invasion. California's beaches were strung with miles upon miles of barbed wire. Coastal cities were blacked out and citizens sandbagged their homes and businesses [California State Military Department 2016].

Volunteer lookouts were posted all along the coastline, and defensive facilities were established. The Clarke Museum in Eureka, Humboldt County, has posted this description of the situation:

> …A network of 55 air raid warning posts, staffed 24 hours a day by civilian volunteers, was established to provide an early warning system for the community. Each post was equipped with state-of-the-art airplane detection instruments and a direct telephone line to any army command post. Upon detection of an air raid threat an alarm would be

[23] https://www.archives.gov/research/military/ww1/draft-registration/california.html

sounded throughout the county.

> …Due to the close proximity to the Pacific, blackouts in coastal communities such as Ferndale, Eureka, Samoa, and Trinidad were seen as a crucial step to avoid air attacks along the Humboldt coastline [Clarke Museum 2016].

One rare survival of the defensive facilities established during the way is located in Redwood National Park: the Klamath River early-warning radar station (Radar Station B-71). The station was operated by members of the Army Air Corps who were quartered at the nearby town of Klamath (NPS 2016). This was the northernmost of 22 radar stations built along the Pacific Coast during the Second World War. In addition, at least three wartime resources have been recorded on BLM-managed lands in the Planning Area: a World War II radio receiver that was placed at the former location of the Humboldt Harbor Lighthouse, ammunition bunkers at the Samoa Dunes, and the Humboldt Bay Coast Guard station, which was "involved in beach patrols" during the war (Van Kirk 1977:3).

The Second World War, like the first, also had an economic impact on the Planning Area. The 1942 War Production Board Limitation Order L-208 ordered all non-essential gold mines to cease production, to conserve equipment and manpower for the war effort. As a result, "[g]old mining was curtailed during World War II and has not recovered since…Alleghany [in southwestern Sierra County] was the only town in California after World War II where gold mining was the principal segment of the economy" (Clark 1970:xi, 21). Some mining resumed in the Planning Area after the war, including the Dillon Creek and Igo-Ono districts and in the Shasta zinc-copper belt, but never on a scale anything like what occurred in the nineteenth century.

Federal Land Management

Federal management of public lands in California began less than 60 years after its annexation by the United States, beginning with the first Forest Reserves—including the Shasta Forest Reserve—in 1905 (US Forest Service 2016). Recognizing the timber, grazing, mineral, water, and other valuable resources on those lands, the US Congress called for federal management of public lands in the west, a shift from the earlier policy of encouraging private settlement. New regulations covered the use of these lands, in an attempt to balance the various extractive enterprises with conservation, environmental protection, and recreation.

A critical aspect of this new management philosophy, particularly the laying-out of Forest Reserves and other public lands, was the establishment of accurate land boundaries. The General Land Office (GLO), first created in 1812 as part of the Treasury Department, had been instrumental in the defining of ownership boundaries for homesteads, mining patents, railroad patents, and other interests beginning with California statehood (and continuing to this day). The GLO also served as a clearinghouse for all land records. In 1946, the US Grazing Service and the General Land Office merged to form the Bureau of Land Management, which continues to maintain the historical GLO plats and survey data (White 1982).

The California redwoods were among the first natural resources in the north state to draw the attention of preservationists. From an estimated 2,000,000 million acres of old-growth redwood forest in 1850, unrestricted clear-cutting had removed nearly 90% by the middle of the twentieth century. The Save the Redwoods League, founded in 1918, lobbied for preservation of what remained. The US Congress and the California State Park Commission (now the Department of Parks and Recreation) established multiple National and State Parks in Humboldt and Del Norte Counties for cooperative forest management and stabilization of soils, wildlife, and watersheds.

Management of other forests also fell (and continues to fall) partly under the jurisdiction of the federal government in California, mostly under the purview of the US Forest Service but also, to a lesser extent, under BLM. Logging has been particularly important to the local economies of the Klamath and

Trinity regions. This continuum of activity has created an archaeological record of the technological and procedural changes in the logging and lumbering industry over a period of 150 years.

Federal land- and resource-management agencies quickly became a key element in the economic and political life of the region. Ranger stations were established, staffed with rangers, trail crews, and dispatchers, employing men who could no longer make a living by mining. The Forest Service put in telephone lines, kept roads and trails open, fought wildfires, issued grazing permits, and began reforestation projects (Fiorini-Jenner and Hall 2002:100–104). After World War I the local presence of federal agencies increased, as the government designed and implemented policies and regulations relating to the protection of natural resources. Firefighting became a primary focus, and protection of the forest's timber resources was paramount.

The BLM was not established until 1946, with the merger of the General Land Office and the Grazing Service. The agency was designed to fill a very specific need:

> Rather than offering land that could be divided up into farm-size units and claimed by hardy yeomen, the West presented vast areas of land, characterized by elevation, ruggedness, and aridity, that were not at all suited to farming. The long-range outcome was a vast domain of otherwise unwanted land that stayed in the ownership and under the management of the federal government…The greatest share of that land is now the responsibility of the BLM [Limerick 2016].[24]

One key function of the BLM and other federal agencies was (and is) management of grazing lands and allotments. The unregulated grazing that took place prior to passage of the 1934 Taylor Grazing Act caused damage to soils, plants, and water sources, causing erosion and other problems (BLM 2016). Water projects, foraging surveys, fencing, and permitting were implemented to alleviate these issues. Another important element of BLM land management in northwestern California is public recreation, particularly at places like the Whiskeytown National Recreation Area, the Sacramento River Bend Outstanding Natural Area, the South Spit of Humboldt Bay, and the Samoa Dunes Recreation Area.

Modern Hydroelectric Development

By the end of the nineteenth century, "the fever of hydroelectric development was sweeping California" (Coleman 1952:212). Within a few decades, electrical power was increasingly in demand in the state, and power company engineers began looking to the hydroelectric generation possibilities of the Sierra Nevada and Cascade mountain ranges, where mining had already shown it to be feasible on a smaller scale. Passage of the Newlands Reclamation Act in 1902 provided federal funds for the construction of dams, reservoirs, and canals in the West. These features were designed to provide irrigation water, but they also created additional opportunities for hydroelectric development.

One of the earliest such development in the Planning Area was the North Mountain Power Company operation near Junction City, built in 1904. The system included ditches, flumes, and siphons to transport water from Canyon Creek to a powerhouse on the Trinity River below Junction City; upon its completion the company "began selling electricity to Eureka and other communities on the coast" (Adkins 2007:271). Adkins also says that the North Mountain Power Company supplied most of the electricity in northwestern California until Pacific Gas and Electric (PG&E) purchased the company in 1919 (interestingly, Coleman (1952) does not mention the company at all, at least by that name). Archaeological resource P-53-001413, the Junction City Water Ditch, apparently carried water used to generate power for the town of Junction City. It is possible that the ditch is associated with the North Mountain operations.

[24] A very detailed history of the agency and its multiple-use mission is presented by Muhn and Stuart (1988).

Very soon, the federal government began to withdraw potential hydroelectric development sites, to "prevent speculation and the inevitable inefficiency, inadequate funding, and poor planning of most private hydroelectric projects" (Adkins 2007:272). Under the Federal Water Power Act of 1920, a Federal Power Commission was created to issue licenses for the construction, operation, and maintenance of dams, reservoirs, powerhouses, and related features. The following year, the USGS began surveying potential hydroelectric dam and reservoir sites across the country. Some of the first federally funded archaeological surveys would follow: the River Basin Surveys (1945–1964) directed by the Smithsonian Institution.

Hydroelectric power generation has become a vital activity in the Planning Area, with federal (Bureau of Reclamation) power plants at Shasta, Keswick, Trinity, Spring Creek, French Gulch, and Lewiston (BOR 2016a); and a complex network of dams, tunnels, canals, and plants operated by PG&E on the major rivers and their tributaries. Relevant studies of these resources include Coleman (1952), Reynolds and Scott (1980), Billington et al. (2005), Adkins (2007), Byrd et al. (2008), and Kellawan (2012). In particular, Billington et al. and Montgomery and Clawson (1946) provide detailed histories of the Central Valley Project and one of its key features: Shasta (originally Kennett) Dam. In 1990, the California State Office of Historic Preservation determined Shasta Dam and its power plant eligible for the National Register. According to their website, Reclamation is nominating the Central Valley Project to the National Register as a Multiple Property Listing (BOR 2016b).