A Geoarchaeological Overview and Assessment of Caltrans District 3

Cultural Resources Inventory of Caltrans District 3 Rural Conventional Highways

By:
Jack Meyer and Jeffrey S. Rosenthal

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Placer
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Yolo
Yuba

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"So far as physical environment is concerned, man could thus have lived here from his most remote antiquity. But any record which he might have left would have been buried by recent alluvium and would be difficult to access except in extraordinary circumstances or by chance. Moreover, the present wash of alluvial fans and silting over of the valley floor would tend to obliterate quickly human remains of even a few thousand or perhaps a few hundred years ago. Accordingly the archaeologist who approaches the region has little justification for expecting to secure very ancient data." (Schenck and Dawson 1929:294)

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INTRODUCTION

The California Department of Transportation (Caltrans) is conducting a cultural resources inventory of the rural roads in District 3, which includes the counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, Sacramento, Sierra, Sutter, Yolo, and Yuba (Figure 1). The inventory combines survey for prehistoric and historic-period archaeological sites, historic-period resources, and architectural properties, along with Native American consultations and ethnographic studies of the district. In addition, the following geoarchaeological investigation was implemented as part of the inventory to provide Caltrans with baseline information on the potential for buried archaeological resources along rural road segments. Due to the scope of this analysis, it should also serve as a primary reference for cultural resource studies conducted throughout the eleven counties of District 3.

Caltrans District 3 covers a diverse landscape, extending from the crest of the Sierra Nevada on the east, across the adjacent foothills, through the Sacramento Valley, and ending in the coastal range on the west (Figure 1). This region of California has witnessed dramatic changes over the last 15,000 years, resulting in a landscape completely different from that encountered by the region's first human inhabitants. In response to regional climatic variations, massive glaciers that once occupied the highest peaks and adjacent slopes of the Sierra Nevada and Coast Ranges receded, numerous genera of mammals including the largest ice-age herbivores became extinct, repeated cycles of erosion and deposition sculpted and transformed the landscape, and the massive Sacramento-San Joaquin Delta-Estuary emerged where a river confluence once existed. Such extensive changes have not only affected how humans interacted with the environment, but also how and where evidence of past human occupation is preserved in the modern landscape.

The approach taken by this study acknowledges that the archaeological record of central California is inherently biased by processes of landscape evolution, and that older archaeological deposits are always under-represented at the surface of the modern landscape. Central California and the lower Sacramento Valley, in particular, have witnessed nearly 100 years of systematic archaeological exploration, yet few sites greater than 3,000 to 4,000 years old have been discovered in the valley (e.g., Meyer 1996; Meyer and Rosenthal 1997; Moratto 1984; Rosenthal and Meyer 2004a, 2004b; Rosenthal et al. 2007; White 2003a). Knowing that humans likely occupied California for as much as 13,500 years (e.g., Johnson et al. 2000), we approach this region with the assumpation that sites dating to the early and middle Holocene exist but have not yet been found. As discussed throughout the following report, we believe the under representation of these older sites is a direct result of recent changes in the geomorphic landscape. To account for these changes, the current study is directed toward understanding the age and depositional history of major landforms within the eleven counties of Caltrans, District 3. By mapping the age of these landforms, we are able to make an initial assessment of the potential for buried archaeological resources throughout a large segment of central California. Maps and descriptions of Holocene landscape evolution generated by this study should supplement surface surveys and provide additional contextual information that can be used by resource managers to make decisions about the need for subsurface reconnaissance in particular study areas.

GOALS AND METHODS

The primary goal of this study is to identify those landforms likely to contain buried archaeological resources and those that are either too old or too young to contain these deposits. A secondary goal is to evaluate the chronostratigraphic structure of Holocene-age landforms as a way of understanding potential biases in the archaeological record, and to provide an initial assessment of the location and context of under-represented portions of the archaeological record, particularly sites older than 3,000 years.

Although large portions of the central California landscape were emplaced long before humans entered North America (>15,000 years ago), numerous recent studies have shown that repeated cycles of erosion, deposition, and landscape stability occurred during the latest Pleistocene and throughout the Holocene (e.g., Allen et al. 1999; Meyer 1996; Meyer and Rosenthal 1997; Rosenthal and Meyer 2004a, 2004b; Shlemon and Begg 1975; White 2003b). These processes have led to surface landforms of different ages in central California—some as old as 100,000 years and others as recent as a few hundred years. Because of this, buried archaeological

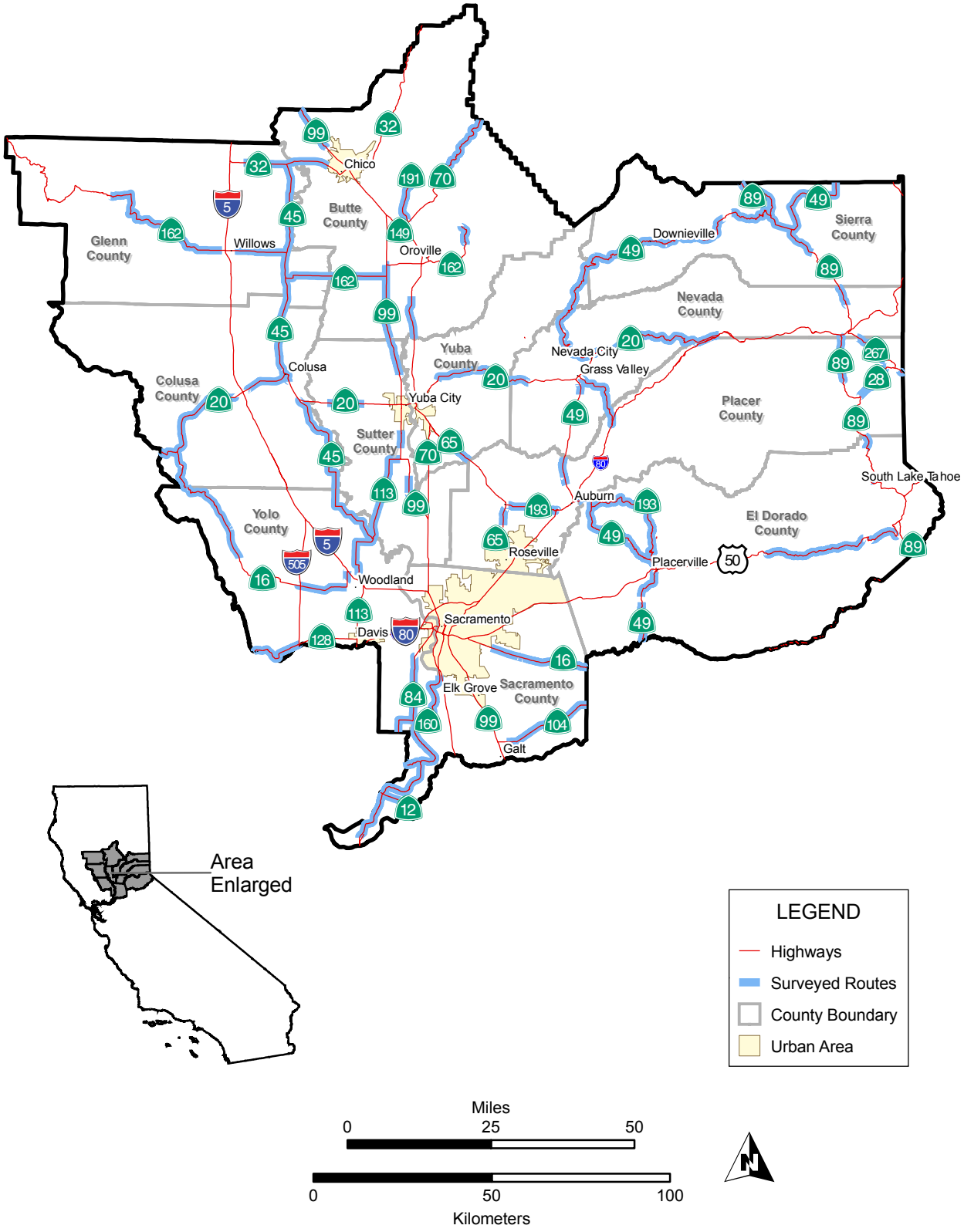


Figure 1. District 3 Rural State Routes, Survey Routes.

deposits are not distributed randomly, but are confined to those portions of the landscape that developed during the span of human occupation, roughly the last 13,500 years (i.e., during the latest Pleistocene and Holocene). Segments of the surface landscape that developed prior to human colonization of North America (i.e., >15,000 to 13,500 years ago) obviously cannot contain buried archaeological deposits (Rosenthal and Meyer 2004a, 2004b). With this basic understanding, the search for buried portions of the archaeological record in District 3 can be narrowed to recent landform segments, allowing large, older portions of the landscape to be confidently excluded from consideration.

To identify the age and extent of different landform segments within the study area, we relied heavily on existing soils studies and the recently compiled Soil Survey Geographic Database (SSURGO). Because soil formation is a by-product of sustained or prolonged landscape stability, soil development is directly related to the amount of time a landform has been subject to near-surface weathering processes. Landforms with well-developed soils have been stable longer than those with weakly or moderately developed soils. Using these characteristics of soil development we were able to group soil types and landform segments with similar weathering profiles into larger chronostratigraphic units within the SSURGO database. The age of different soil series and their associated landforms were further refined through the compilation of existing radiocarbon dates and obsidian hydration information, analysis of landform superposition, field examination of stratigraphic relationships and soil development, and targeted radiocarbon dating. From this work, we produced a detailed map of latest Pleistocene, Holocene, and Historical landforms in District 3. The age of these landforms serves as a basis for determining their potential to contain buried archaeological deposits and allows for an initial assessment of the relationship between archaeological sites of different ages and the timing of landscape evolution in central California.

SCOPE OF THIS STUDY

Our primary focus has been on the valley counties of Yolo, Sacramento, Sutter, Glenn, Colusa, and Butte, which could be mapped in detail using digital soils surveys. Because of the developmental complexity and heterogeneity of landforms in the foothill and mountain counties of El Dorado, Placer, Nevada, Yuba and Sierra, these areas could not be mapped as precisely. Rather, age and sensitivity assignments were only made for major valley segments in these upland counties (e.g., Sierra Valley). The remainder of the uplands in the Sierra Nevada and Coast Ranges are mapped and treated in a more general way, by focusing on specific examples which provide insight into the types of landforms and landform segments that hold the greatest potential for buried archaeological resources.

STRUCTURE OF THIS REPORT

This report is divided into six chapters. Chapter 1 provides a description of the geologic structure, climate, natural vegetation, and animal life of central California. Chapter 2 discusses the natural and cultural history of the study area. Included is a summary of paleoenvironmental records and the history of human occupation; the latter emphasizing economic and technological change through time. Chapter 3 describes existing information on the Quaternary stratigraphy and depositional history of the study area. A discussion of methods and results from the current field and mapping effort is presented in Chapter 4, while Chapter 5 considers the structure of the known archaeological record with reference to the timing and extent of Holocene landscape evolution in the study area. The potential for buried archaeological sites in different landforms is discussed in Chapter 6. In this section, we also consider the geological context of archaeological deposits from different cultural periods and provide some observations on the nature of landscape evolution and its effects on the structure of the archaeological record in the study area. Four appendices are also included. Appendix A is a comprehensive database of radiocarbon dates from District 3; Appendix B is a correlation between different soil types and the map units presented in this study; Appendix C provides a database of obsidian hydration and sourcing information for District 3; and lastly, Appendix D includes a glossary of geological and soil science terms used in this report.

CHAPTER 1: ENVIRONMENTAL SETTING

District 3 extends over parts of four major physiographic subregions: the northern Sierra Nevada, southwest Cascade Range, eastern North Coast Ranges, and the lower Sacramento Valley and Delta region. The varied relief and physiography of District 3 creates significant differences in temperature and precipitation between the four major subregions. These differences, likewise, have a distinct effect on the distribution of plant and animal communities in the study area, which in turn had a direct bearing on past human settlement-subsistence strategies. Likewise, differences in physiography, climate, and vegetation across the study area all contributed to the nature and extent of landscape evolution during the period of human occupation (approximately the last 13,500 years), and as a consequence, the preservation of archaeological sites from different time periods.

GEOLOGY AND DEPOSITIONAL HISTORY

This section describes the geology and topography of the major bedrock units and Quaternary-age deposits in the four major subregions as they occur within District 3. The depositional history is summarized, with the emphasis placed on late Quaternary deposits, less than fifty thousand years old, in the Sacramento Valley and Delta region (Figure 2). The age, nature, and extent of these younger deposits are described and discussed in Chapter 3.

Please note that in this report, all age assignments that were originally based on uncalibrated radiocarbon dates less than 20,300 ^{14}C BP have been calibrated and are expressed as the central intercept or median probability in calendar (solar) years before present (cal BP), unless otherwise noted. Dates older than 20,300 ^{14}C BP continue to be reported in conventional radiocarbon years before present (^{14}C BP) because they remain beyond the range of calibration; 1950 AD represents the "present" by international convention.

Sierra Nevada

The eastern-half of District 3 is dominated by the steep and rugged mountains of the northern Sierra Nevada. The Sierra Nevada is a 50-80-mile- (80-130-kilometer-) wide mountain range that extends southeast to northwest for more than 400 miles (644 kilometers) across eastern California, from the Mohave Desert on the south to the Cascade Range on the north (Bateman and Wahrhaftig 1966:107). The range is asymmetric in cross section with a broad and gradually rising, western slope and a relatively short and steep eastern slope. Unlike the crest of the central and southern Sierra Nevada, which lies well above 10,000 feet (3,048 meters), the northern crest in District 3 generally lies at elevations of only about 8,000 feet (2,438 meters) above mean sea level (amsl), with the tallest peaks being little more than 9,000 feet (2,743 meters) amsl; Freel Peak in El Dorado County is the highest point at 10,881 feet (3,316 meters) amsl.

The upper Sierra bedrock is divided from bedrock of the lower foothills by a series of northwest-trending fault blocks that together form the foothill fault zone (Harden and Marchand 1980). The foothills of the western slope are characterized by steep ridges and rolling hills that grade into nearly level valleys. Relatively narrow alluvial floodplains often occupy the floors of these valleys, which are sometimes punctuated by isolated bedrock outcrops, known as knockers. Several relatively large intermontane valleys are found on the slope east of the Sierra crest, including the Martis Valley in Nevada and Placer counties, Sardine Valley in Sierra County, the Tahoe/Truckee Basin in El Dorado and Placer counties, and the southernmost parts of both Sierra and Long valleys in Sierra County. Some of the larger valleys contain natural lakes (e.g., Donner Lake, Lake Tahoe) that are often accompanied by marshes and meadows.

Beginning in the early Cenozoic, rapid uplift and westward tilting of large fault blocks accompanied the emplacement of the large granitic batholiths that now form the Sierra crest (Bateman 1992; Huber 1981). The emplacement of these batholiths was driven by the convergence and subduction of tectonic plates along the western margin of the North American continent (Harden 2004:173). As a result, the upper northern Sierra is composed primarily of Paleozoic and Mesozoic metasedimentary and volcanic bedrock (Figure 3) that were uplifted by the intrusive Mesozoic batholith (Durrell 1966, 1987).

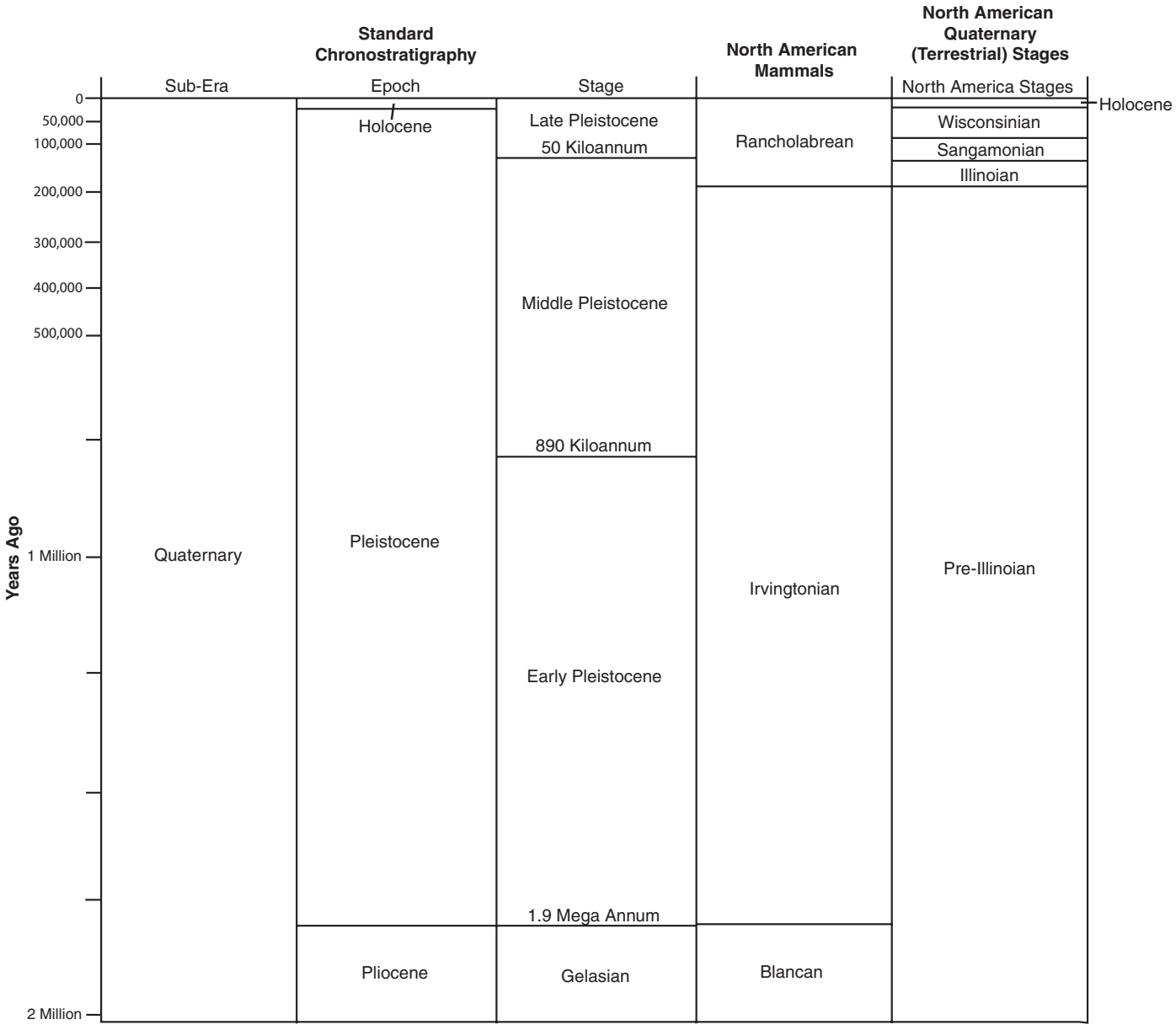


Figure 2. Major Subdivision of Geologic Time Over the Past Two Million Years.

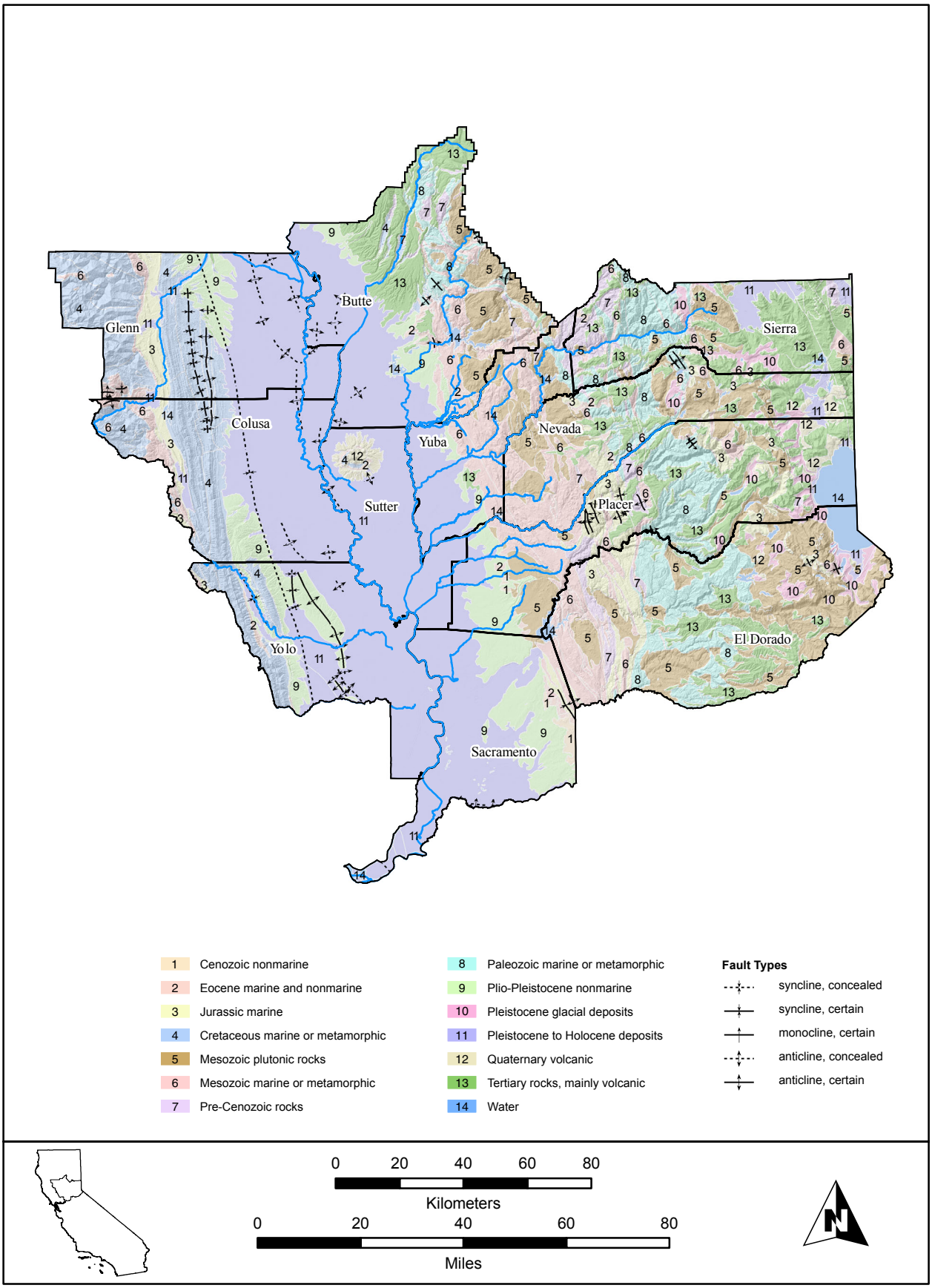


Figure 3. Generalized Geology of Caltrans District 3.

This mountain-building period was accompanied by folding, faulting, and metamorphism of rocks that created the lower western foothills (Clark 1976). The foothills are underlain by a series of northwest-trending blocks of metamorphic rock that generally decrease in age and extent of metamorphism from east to west (Lydon and Klein 1990). Most of the foothills belt consists of moderately metamorphosed rocks of sedimentary (marine) or volcanic origin. The most common rock types include layered (i.e., foliated) schist and slate, and non-foliated hornfels, marble, quartzite, and metachert (Harden 2004:176-179).

Two major fault systems composed of separate fault strands extend the entire length of the metamorphic belt: the New Melones system (eastern branch) and the Big Bend-Wolf Creek-Bear Mountain system (Biggar et al. 1978; Clark 1960, 1976; Hilton 1994). Some of these fault strands include the Dewitt and Maidu faults near Auburn in Sacramento County, the Spenceville and Swain Ravine faults near Smartville in Yuba County, and the Cleveland Hills fault near Oroville in Butte County (Harwood and Helley 1987). While the majority of these faults have been inactive for 100,000 years or more, evidence of possible Holocene movement has been identified on two faults near Auburn (Borchardt et al. 1980:35), and the most recent activity, a magnitude 5.7 earthquake, on the Cleveland Hills fault in August 1975 (Sherburne and Hauge 1975:49).

The combination of uplift, intensive weathering, and subsequent erosion of the overlying deposits exposed some of the oldest rocks on the northern Sierra Nevada, such as the Paleozoic-age Calaveras and Shoo Fly complexes, and blocks of Mesozoic-age metamorphic rocks known as roof pendants. The Shoo Fly consists of a variety of rock types that include chert, felsitic tuff, greywacke, greenstone, and phyllite (McMath 1966:179) that may have been an important source of toolstone on the western slope.

Heat generated by the batholith intrusion also concentrated gold inside veins formed within the older rocks. One of the most successful gold mining districts in California was located in District 3 at Grass Valley in western Nevada County (Harden 2004). Weathering and erosion during the Tertiary period produced gold-bearing Auriferous Gravel deposits, like those beneath Table Mountain near Oroville, that mark ancient river channels that once drained the region (Lindgren 1911). Outwash from these rivers was deposited in continental and near-shore environments that produced the Eocene-age Ione formation. The Ione is characterized by quartzose sandstone and kaolinitic clay that was produced by intense surface weathering in tropical or subtropical environments (Durrell 1966:187).

The late Tertiary (Oligocene to early Miocene) was marked by widespread volcanism that led to the formation of the Valley Springs, Mehrten, Lovejoy Basalt (e.g., Table Mountain near Oroville), and other volcanic deposits on the western slopes of the Sierra Nevada (Durrell 1966). Continued volcanism during the Pliocene and Quaternary Period resulted in accumulations of air-fall ash (tephra) and various pyroclastic deposits on the upper eastern and western slopes of the northern Sierra and southern Cascade Range. Layers of Holocene-age tephra deposits, such as the Tsoyawata and Mazama, have been identified at various locations within District 3.

During the Pleistocene, glaciers repeatedly expanded and contracted over the upper Sierra Nevada. Five episodes of glaciation are generally recognized in the region, which are known from oldest to youngest as the McGee, Sherwin, Tahoe, Tioga, and Recess Peaks (Fullerton 1986; Guyton 1998; Hill 2006). Though the ages of the earliest advances are not well defined, the McGee is estimated to be at least 1.5-million years old, the Sherwin approximately 820,000 years old, and the Tahoe bracketed somewhere between about 150,000 and 40,000 years ago (Gillespie and Zehfuss 2004:54; Hill 2006:311). The ages of the younger advances are better defined by radiocarbon dates, with the Tioga bracketed between about 22,000 and 18,000 cal BP, and Recess Peak between 14,200 and 13,100 cal BP (Gillespie and Zehfuss 2004:54).

The largest and most extensive advances of ice carved out broad U-shaped valleys in the upper reaches of many glaciated drainages. As glaciers advanced down slope, ice likely blocked some drainages leading to the creation of lakes such as Lake Beckwourth, which occupied Sierra Valley in the Middle Fork of the upper Feather River during the early and middle Pleistocene (Durrell 1987; Ramelli et al. 1999). During the Tioga advance of the last glacial maximum (i.e., late Wisconsin), ice flowed down canyons from the Sierra crest to elevations as low as 6,050 feet (1,844 meters) amsl in the Tahoe basin (Howle et al. 2005), and to at least 5,971 feet (1,820 meters) in the Bear River headwaters between State Route 20 and Interstate 80 west of Emigrant Gap (James et al. 2002). At the same time, glacially induced erosion and mass-wasting of the upper Sierra crest resulted in the deposition of till, moraines, and outwash deposits in valleys, both east and west of the crest (Bateman and Wahrhaftig 1966). As the ice melted and retreated during the latest Pleistocene, numerous natural lakes accumulated in bedrock cirques (e.g.,

Lake Aloha, Rockbound Lake in El Dorado County) and behind morainal ridges (e.g., Cascade Lake, Donner Lake, Fallen Leaf Lake, Gold Lake, Independence Lake, Upper and Lower Sardine lakes), and shallow freshwater marshes formed in various basins and valleys (e.g., Mohawk Lake in Plumas County; Yount et al. 1993).

Multiple advances are recorded by glacial landforms at numerous locations within District 3, such as the upper reaches of the American, Bear, Feather, and Yuba rivers, including Sierra Valley, and the upper Truckee River which includes the Lake Tahoe basin. While tills corresponding to each major advance have been identified in the Tahoe area (Birkeland 1964), only three distinct glacial advances have so far been identified in the Sierra north of the American River drainage, which date roughly between about 80,000 and 18,600 years ago (James et al. 2002). The oldest of these advances is informally known as the Washington alloformation, and produced broad-crested moraines that are preserved at enough locations to define its maximum extent (James et al. 2002:413). While these moraines are not yet correlated with other Sierra advances, they are estimated to be "early or middle Wisconsinian in age" based on their morphology (James et al. 2002:414), which would place them between 50,000 and 30,000 years ago (see Figure 2). The best preserved glacial landforms in District 3 are the Tioga till, moraine, and outwash deposits that are late Wisconsin in age (~30,000 to 19,000 years ago) found in the higher elevations of El Dorado, Placer, Nevada, and Butte counties.

Glacial deposits indicate that the Washington alloformation extended downslope farther than the Tioga advance, as did the Tahoe advance in other parts of the Sierra. A cosmogenic radionuculide surface-exposure age of 14,000 ± 1500 years BP, from glacially striated bedrock in the upper South Yuba River of Placer County, suggests that ice retreated rapidly around that time (James et al. 2002:409). No definitive evidence for subsequent glacial advances (e.g., Little Ice Age) has been reported from the region. Based on this record it appears that glaciation of the northern Sierra may have started later, ended earlier, and did not extend as far down slope as elsewhere in the Sierra. It appears that the lower elevation of the northern crest, as compared to the central and southern crest, influenced the magnitude and/or timing of geomorphic responses to climate change (Busacca et al. 1989:7).

Uplift, glaciations, and weathering throughout the Pleistocene caused extensive erosion of the bedrock and older glacial deposits that caused many streams and rivers to entrench their channels deep into bedrock canyons (Clark 1970:5; Huber 1981:11; James 2003a). Much of the material that eroded from the northern Sierra Nevada during the Pleistocene and subsequent Holocene periods were either deposited in upper intermontane valleys (e.g., Sierra Valley), or on the floor of the Sacramento Valley (Bateman and Wahrhaftig 1966:161).

Last but not least, hydraulic gold mining in the Historic-period caused massive erosion and sediment deposition in each major stream and river that drained the region, especially along the lower Feather and Yuba rivers near Marysville and Yuba City (Gilbert 1917; James 1989; James and Davis 1994; Lindgren 1911).

Cascade Range

The Cascade Range extends about 700 miles from southern British Columbia through Washington and Oregon to Northern California. It includes both non-volcanic mountains and volcanoes known as the High Cascades, such as Mount Shasta and Mount Lassen; the latter is located about 25 miles north of District 3. The Middle Fork of the Feather River is generally considered as the division between the southern Cascade Range and the northern Sierra Nevada physiographic provinces. The southern Cascade Ranges are composed of "hundreds of coalescing small to medium sized volcanoes" that erupted over relatively short periods of time during the late Cenozoic (Clynne et al. 2000a:1). These volcanic deposits generally overlie older igneous and sedimentary rocks such as the Montgomery, and Chico formations (Macdonald 1966).

A small part of the southern Cascade Range extends into the north-central part of District 3, mainly in the northeast corner of Butte County. Prominent faults in this area include the Chico Monocline, Cohasset Ridge, and Magalia (Harwood and Helley 1987). This part of the range is characterized by a series of steep, rugged ridges and intervening narrow canyons; Lost Lake Ridge is the highest point at 7,120 feet (2,170 meters) amsl. The largest drainage is the North Fork Feather River, and its related tributaries, which has its headwater located well north and east of the District. Parts of the western slope are drained by small streams such as Big Chico, Butte, Mud, Pine, and Rock creeks. These creeks are generally down-cut through late Pliocene-age volcanic deposits of the Tuscan formation, which include the Nomlaki tuff (Macdonald 1966:71).

At an elevation of 10,462 feet (3,189 meters) amsl, Mount Lassen is the southernmost volcano in the Cascade Range, and one of the few active volcanoes in the continental United States. The Lassen volcanic center is primarily composed of silicic rocks (mainly andesite, basalt, and dacite) created by the complex mixing of magma in the earth's crust (Clynne 1999; Clynne et al. 2000a). This area was formed by three major periods of volcanism over the past 600,000 years (Clynne et al. 2000a). Current evidence suggests that the dacite dome of Lassen Peak was formed about 27,000 years ago (Turrin et al. 1998).

The Lassen center also produced a complex sequence of latest Holocene-age dacite domes and associated pyroclastic (pumice) deposits known as Chaos Crags that date between about 1065 and 930 cal BP (Christiansen et al. 2002; Crandall et al. 1974). An extensive cold-rock avalanche known as "Chaos Jumbles" was deposited northwest of Chaos Crags after the catastrophic collapse of Chaos Crags dome around 300 years ago. Renewed volcanism during the past 300 years resulted in the formation of a scoria "Cinder Cone," lava beds, and volcanic ash that was deposited at least two to three miles around the cone. Historical eruptions of Lassen Peak between 1914 and 1922 produced a variety of deposits that included ash, avalanches, dacite lava dome and flow, mudflows (lahars), pumice, and pyroclastic flows (Clynne et al. 1999), which are most evident in the "Devastated Area" on the northeast side of Lassen Peak (Clynne et al. 1999; Eppler and Malin 1989; Loomis 1926).

Most of the upper Cascade Range was affected by one or more periods of Pleistocene glaciation. Major accumulations of glacial ice formed on Brokeoff Volcano, more than 35,000 years ago (i.e., Tahoe-age), radiated down many of the surrounding valleys (Turrin et al. 1998:944). Following its emplacement some 27,000 years ago, the center of glaciation shifted to Lassen Peak during the last major glacial advance (Tioga), and ice flowed down the valleys north of the peak. This resulted in the formation of lateral moraines and thick deposits of till that are the most conspicuous and best-preserved glacial deposits in the Lassen area (Kane 1975:92). Evidence of the latest Pleistocene glaciation is indicated by the presence of moraines and protalus ramparts on the upper portions of Lassen Peak (Gerstel 1989:35). Protalus ramparts on the north side of Reading Peak and nested moraines at the base of a "mini-glacier" on the east side of Lassen Peak have been interpreted as evidence of a Holocene-age advance that occurred sometime between 12,000 and 9,000 years ago (Christiansen et al. 2002:6; Gerstel 1989; Turrin et al. 1998).

Within District 3, glacial deposits are the most extensive in the upper reaches of Butte, Fish, and Kimshew creeks and the West Branch of the Feather River located in the Lassen National Forest of northeast Butte County. Though not directly dated, the glacial record and preservation of these landforms suggests that most date to the latest Pleistocene, or Tioga advance. The distribution of these deposits suggest that ice may have extended to elevations as low as 4,820 feet (1,469 meters) along upper Butte Creek near Jonesville, and about 4,720 feet (1,438 meters) in the upper Kimshew Creek drainage. From this it appears Pleistocene glaciation of the southern Cascade Range extended farther downslope than it did in the adjoining northern Sierra Nevada.

Much like the Sierra, material that eroded from the southern Cascade Range during the Pleistocene and Holocene was either deposited in small upland basins and valleys (e.g., Butte and Cirby meadows), or on the floor of the Sacramento Valley. Sediment derived from Historic-period gold mining operations caused large volumes of sediment to be deposited along some local streams, particularly along Dry Creek where the Cherokee hydraulic gold mine was located, north of Oroville (Burkett and Conlin 2006:5-6).

Coast Ranges

The Coast Ranges extend for more than 540 miles (870 kilometers) across most of western California, between the Transverse Ranges and Oregon (southeast to northwest). This mountainous region includes "many separate ranges, coalescing mountain masses, and several major structural valleys" (Page 1966:255). Only the northern portion of this geologically complex and topographically variable range is in District 3.

The majority of the range lies at elevations of about 2,000 feet (600 meters) amsl, with several peaks and ridges extending to more than 6,000 feet (1,829 meters) amsl. Black Butte, located in Glenn County, is the highest point at 7,448 feet (2,270 meters) amsl, followed by Snow Mountain East in northwest Colusa County at 7,040 feet (2,146 meters) amsl. The lowest elevation of the range is about 180 feet (55 meters) amsl in southwest Yolo County near the town of Winters. The topography exerts a considerable control on the drainage networks, which tend to form trellis-like patterns as streams follow the valleys for some distance before cutting through

ridges and gaps to the east (Olmstead and Davis 1961:33). The lower reaches of these structurally controlled valleys generally function as basins for the deposition of sediments and formation of alluvial and colluvial landforms, such as fans, footslopes, and floodplains. As discussed below in Chapter 4, many of these landforms were deposited over the past 13,500 years during the known span of human occupation in the region.

The origin and overall structure of the northern Coast Ranges is largely related to tectonic activity that occurred along the western margin of the North American plate more than 140 million years ago (Unruh et al. 2001). Relative movements between the Pacific and North American plates caused the accretion and complex deformation of the underlying basement rocks. The range is generally bounded to the west by the San Andreas Fault and to the east by the Great Valley Fault, both composed of many individual fault segments. Important fault segments identified in the northern Coast Ranges of District 3 include the Barlett Springs, Bear Creek, Black Butte, Capay, East Valley, Elk Creek, Funks, Green Valley, Orland, Paskenta, Rumsey Hills, Salt Creek, Stony Creek, Sweitzer, Valley Side, West Valley, and Willows faults (Figure 4; Harwood and Helley 1987; Unruh et al. 2001). These faults have generally accommodated and translated the tectonic activity and seismic stresses through vertical and/or horizontal displacements. As a result, the ranges now form a series of roughly parallel ridges and intervening valleys, which are oriented slightly west of north.

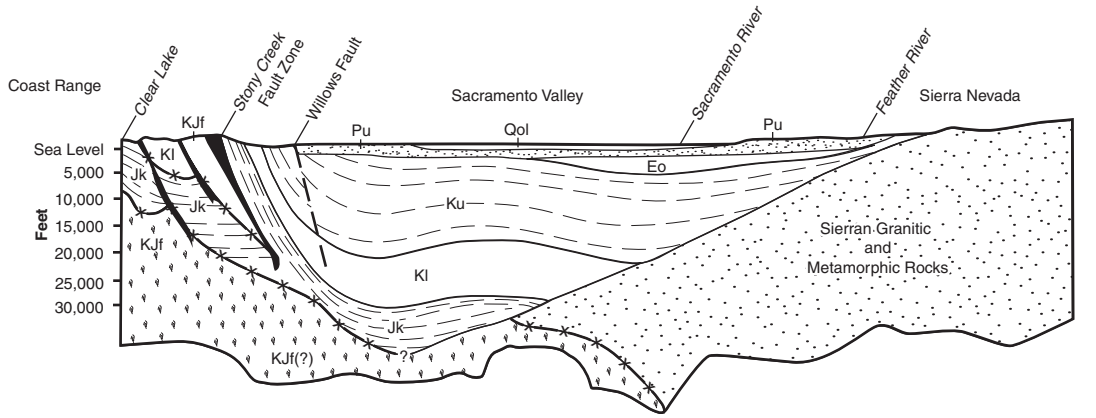
The northern Coast Ranges in the study area are underlain primarily by a disorderly assemblage of upper Jurassic- to middle Cretaceous-age metamorphic rocks known as the Franciscan complex (Page 1966), which is a chaotic mixture of chert, greywacke, greenstone basalt, limestone, serpentine, shale, and sandstone rocks. These originated mainly as marine deposits that were subsequently metamorphosed (Wagner et al. 1990) and uplifted from the sea by tectonic activity (folding, faulting, and thrusting) along the major fault zones during the Cretaceous period (see Figure 3).

This period of mountain building also uplifted thick sedimentary deposits of marine origin that range from late Jurassic to early Tertiary in age (Wagner et al. 1990). The most extensive of these deposits is the Great Valley sequence, which extends along the range's eastern flank near the margin of the Sacramento Valley (see Figure 3). Rocks of the Great Valley sequence consist mainly of inter-bedded sandstone, greywacke, shale, mudstone, and conglomerates containing gravel and cobbles of chert, dacite, quartzite, and rhyolite (Page 1966). Geologists have further sub-divided the Franciscan and Great Valley complexes into a number of fault-bounded tectonostratigraphic terranes (Graymer et al. 2002:2).

These major bedrock units are partly and uncomfortably overlain by a series of Cenozoic-age deposits of marine and volcanic origins, which are best represented at lower elevations along the valley's western margin. Lower Eocene marine deposits include bedded shale and sandstone of the Meganos formation, north of Putah Creek, and the Capay formation shale that outcrops along the west side of Capay Valley in Yolo County (see Figure 3; Olmstead and Davis 1961).

Volcanic deposits include a series of basalt flows and the Tehama Formation, both late Pliocene in age. Outcrops of basalt have been identified in Glenn County at Orland Buttes south of Stony Creek, and in the foothills between Putah Creek and Chickahominy Slough in Yolo County (see Figure 3; Olmstead and Davis 1961:52). The Tehama Formation consists of semi-consolidated silt, clay, sand, and gravel derived from erosion of volcanic deposits in the Coast Ranges and Klamath Mountains. The Putah Tuff member sometimes occurs near the base of the formation (Graymer et al. 2002). Though the Tehama Formation is generally thin, discontinuous, and deeply weathered, relatively extensive outcrops occur along the western margin of the valley, with a few extending into the valley (e.g., Dunnigan Hills and Plainfield Ridge in Yolo County). Included in the Tehama Formation are some slightly younger continental deposits known as the Cache Formation that form high dissected terraces along portions of Cache Creek (Lawson 1956).

Quaternary-age alluvial deposits of continental origin partly cover the Pliocene and older deposits. The oldest of these is the Red Bluff Formation which consists of poorly sorted gravel with thin beds of reddish clay. These deposits are overlain in places by the Rockland ash that dates to about 450,000 years ago. Red Bluff forms a broad erosional surface, or pediment, of low relief, which can serve as a datum to assess Pleistocene deformation (Helley and Jaworowski 1985). Outcrops of Red Bluff can be found on many dissected and uplifted landforms along the valley's west side, but are well preserved in the foothills west of Orland, and in the Dunnigan Hills of Yolo County (Helley and Jaworowski 1985).



(Adapted from Oakeshott 1971:258)

Qol	Alluvium
Pu	Pliocene Sediments and Volcanics
Eo	Early Tertiary Marine and Landlaid Sedimentary Rocks
Ku	Upper Cretaceous Marine
Kl	Lower Cretaceous Marine
Jk	Upper Jurassic Marine Shale
KJf	Franciscan Formation
■	Serpentine
—x—x—	Major Thrust Faults

Figure 4. Generalized Geologic Section of the Sacramento Valley.

There is also evidence that several of the highest peaks were glaciated during the Pleistocene, particularly in the vicinity of Anthony Peak, Black Butte, and Snow Mountain (Davis 1958; Guyton 1998:92), on the west side of District 3. Holoway (1914) found a terminal moraine on Snow Mountain that extended to an elevation as low as 5,950 feet (1,813 meters) amsl, and De Wit (1991) identified more than two-dozen glacial features in the nearby Yolla-Bolly-Middle Eel Wilderness, with the lowest feature at an elevation of 5,960 feet (1,816 meters) amsl.

While the area covered by these glaciers was very small compared to that of the Sierra Nevada and southern Cascade Range, the runoff generated by the rapid melting ice and snow may have been partly responsible for the development of a distinct sequence of alluvial terraces in the Stony Creek drainage of Colusa and Glenn counties (Steele 1979:130-131). Much like the Sierra, materials that eroded from the north Coast Ranges were deposited within structurally controlled valleys and on the floor of the Sacramento Valley during the Pleistocene and Holocene.

Sacramento Valley and Delta Region

The Sacramento Valley forms the northern one-third of California's Great Central Valley. The valley floor forms a long and nearly level alluvial plain that extends for about 150 miles (250 kilometers) from the base of the Klammath Mountains on the north to the Delta region on the south. This intermontane valley is bounded on the west by the northern Coast Ranges and on the east by the northern Sierra Nevada and southern Cascades. Within District 3, the south-flowing Sacramento River drains the valley as it flows from an elevation of about 165 feet (50 meters) amsl in northwest Butte County to sea level in southwest Sacramento County. The southern part of the valley forms the northern Sacramento-San Joaquin Delta region, with some reclaimed areas now lying well below the present sea level. The highest point is the South Butte peak of Sutter Buttes, which lies at an elevation of 2,117 feet (646 meters) amsl.

The valley is a large, asymmetric, structural trough (syncline) composed at its base by westward-tilting blocks of plutonic and metamorphic rocks along the eastern side, and by highly folded and faulted blocks of metamorphic rocks (Franciscan) along the western side. The valley itself has been partly filled by a thick sequence (up to 20 kilometers, or 12.4 miles) of sedimentary rocks and alluvial deposits that range from late Jurassic to Historical in age (Hackel 1966; Harden 2004). The trough is generally bounded by the Great Valley Fault on the west and the Chico Monocline and related Sierra foothills faults on the east. The valley floor is intersected by fault segments that include the East Valley, West Valley, Willows, and Zamora faults (Harwood and Helley 1987). The longest of these is the Willows Fault, which extends from northern Glenn County through southern Sacramento County (see Figure 4).

During the Mesozoic, the entire valley and surrounding area formed a basin that was inundated by the Pacific Ocean (Hackel 1966). Marine sediments were deposited in the basin until it was eventually cut off from the sea by tectonic activity along the San Andreas Fault during the late Pliocene (~23 to 1.8 million years ago; Bartow 1991; Harden 2004). These marine deposits formed multiple layers of conglomerate, sandstone, shale, and mudstone, known as the Great Valley Sequence, and underlie the western side of the valley. Included are Jurassic-age Knoxville and Cretaceous-age Shasta (lower) and Chico (upper) formations (Hackel 1966). Erosion of the Sierra Nevada during the Tertiary (~65 to 1.8 million years ago) produced thick deposits of continental alluvium (i.e., Mehrten Formation) along the valley's northeast side. By the early Pleistocene (1.8 million years ago), the streams and rivers in the valley drained southward through an outlet in the central Coast Ranges (Priest or Bitterwater valleys), which flowed down the Salinas River Valley before entering the sea (Bartow 1991:32-33).

Tectonism and related volcanism during the Pliocene and early Pleistocene caused deposits from the northern Coast Range (i.e., Wolfskill and Tehama formations), northern Sierra Nevada (i.e., Laguna, Arroyo Seco, Fair Oaks formations), and southern Cascade Range (i.e., Tuscan Formation) to accumulate in parts of the valley not inundated by the sea. In the northern Sacramento Valley, the Tehama interfingers with the Tuscan in a narrow area near the center of the northern Sacramento Valley (Dupre et al. 1991:173). The relationship of the Tehama and Laguna formations in the southern part of the valley is not well understood (Figure 5).

Molten rock deformed and eventually pierced the Mesozoic and Tertiary deposits in an isolated part of northwestern Sutter County sometime between 2.2 and 1.5 million years ago, which led to the formation of a

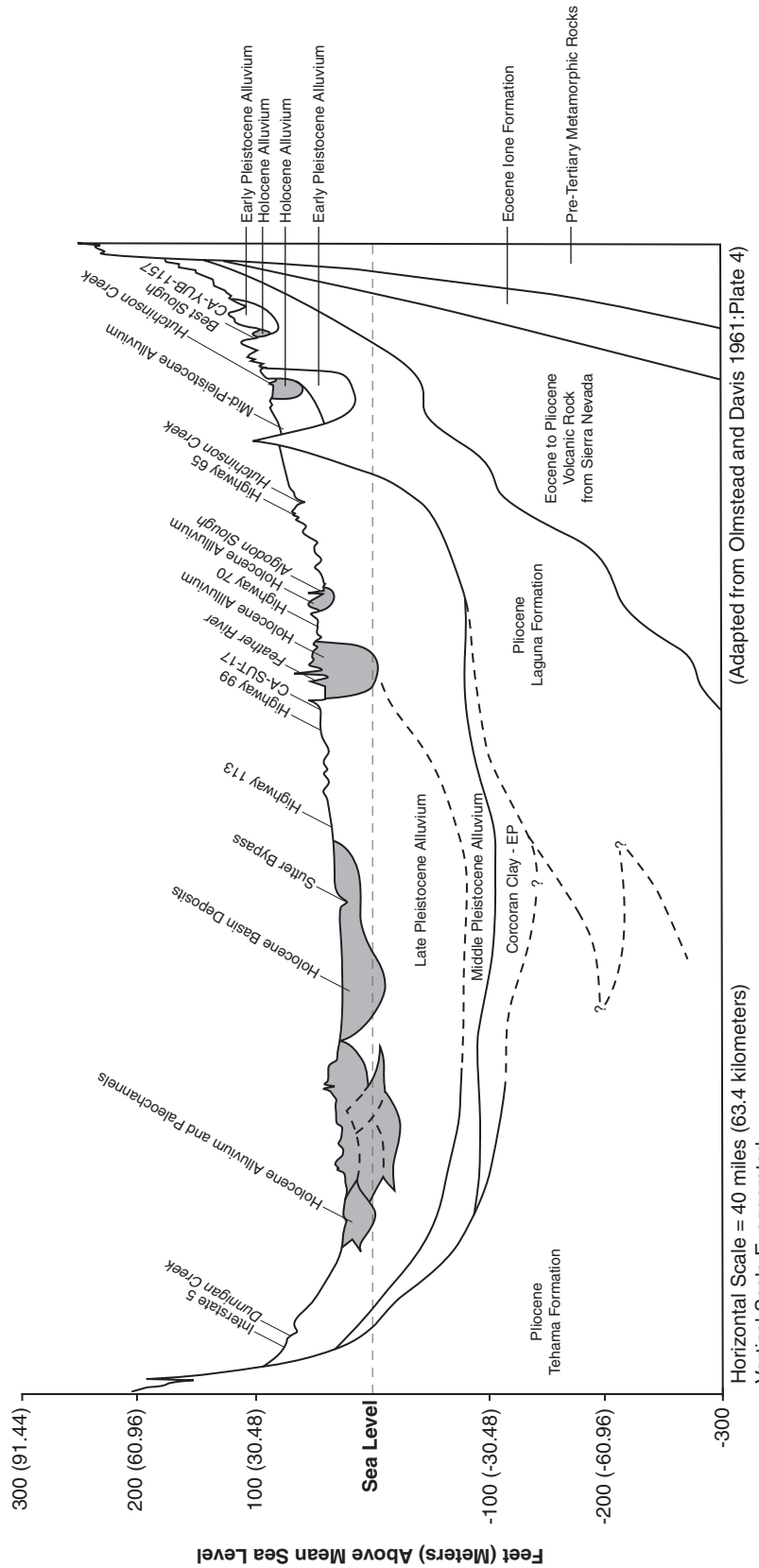


Figure 5. Generalized Cross Section of the Major Geologic Units in the Southern Sacramento Valley.

volcano known as the Sutter Buttes (Hackel 1966; Harden 2004; Swisher et al. 2000). The volcanic portions of the Buttes consist mainly of andesite, rhyolite, tuff, and breccia (Hausback and Nilsen 1999), but some pyroclastic materials were ejected and deposited by explosive eruptions. For example, pyroclastic deposits now fill a deep crater lake that once existed near the center of the Buttes (Harden 2004:269).

The valley's southern outlet was shut off by subsequent uplift of the Coast Ranges between one million and 750,000 years ago, turning the valley into a closed drainage basin (Dupre et al. 1991). As a result, a large lake (Lake Clyde) covered most of the Central Valley during the early to middle Pleistocene (Harden 2004:309, 311). Deposition of fine-grained lacustrine sediments in the lake led to the formation of the Corcoran Clay, a distinctive stratigraphic marker (see Figure 5), and less extensive clay layers in various parts of the Central Valley (Croft 1968, 1972; Janda and Croft 1967). Clay identified in a core northeast of the Dunnigan Hills in Yolo County was tentatively correlated with the Corcoran Clay based on flora and mineralogical similarities (Helley and Jaworowski 1985). The disappearance of Lake Clyde between 600,000 and 450,000 years ago appears to mark the establishment of the current drainage outlet through the Carquinez Straits to the southwest (Bartow 1991:33).

As described above, erosion of the emerging Sierra Nevada during the Pleistocene led to the deposition of large alluvial fans at the base of the foothills along the east side of the Sacramento Valley (Dupre et al. 1991). Glacial conditions are generally credited for the deposition of these fans, while the subsequent interglacial periods are usually associated with land stability, soil formation, and channel incision (Arkley 1962; Atwater 1980; Atwater and Belknap 1980; Busacca 1982; Busacca et al. 1989; Marchand and Allwardt 1981; Olmstead and Davis 1961; Shlemon 1967, 1972; Steele 1979).

During early glacial advances, coarse sand and gravel were deposited at the fan's proximal end (Helley and Harwood 1985), while silt and clay were deposited in proglacial lakes that formed near the fan's distal end (Busacca et al. 1989:18; Cherven 1984). Alluvium from subsequent depositional cycles progressively buried the downstream sections of many older alluvial fans, terraces, and natural levees toward the center of the valley, along with their capping soils; the Llano Seco area is a possible exception (Shlemon 1972:83). The combination of ongoing tectonic deformation and cyclic or episodic sediment deposition led to the formation of inset stream terraces and nested alluvial fans that originated from the foothills of the Coast Range, Cascade Range, and Sierra Nevada (Busacca et al. 1989:7; Dupre et al. 1991).

Delta Region Depositional History

The depositional history of the Delta region is closely tied to deglaciation and rising sea levels. At the height of the last glacial maximum some 22,000 to 19,000 years ago, worldwide sea levels were at least 125 meters (410 feet) lower than today (Figure 6), and the Pacific coastline was located some 25-50 kilometers (about 15-30 miles) west of its current position (Atwater et al. 1977; Bard et al. 1996; Yokoyama et al. 2000). At that time, the Sacramento and San Joaquin rivers formed a single watercourse that flowed through the area now occupied by the San Francisco Bay, and across the continental shelf before entering the Pacific Ocean near the Farallon Islands (Atwater et al. 1977). The area that now makes up the Delta region was at that time a broad inland valley, crossed by numerous streams and rivers with incised channels that were graded to base levels significantly lower than today.

As the continental ice sheets began to melt some 19,000 years ago (Yokoyama et al. 2000), the world's oceans rose rapidly, causing the sea to migrate eastward across the continental shelf. During the latest Pleistocene and early Holocene (14,000-7000 cal BP), the sea rose a total of about 80 meters (~262 feet) at a relatively rapid average rate of about 11.4 meters (~37.4 feet) per 1,000 years, which was enough to fill the lower San Francisco Bay and its adjoining drainages. Sometime between 7000 and 6000 cal BP, the rising waters began to inundate the lowermost parts of the ancestral Central Valley, resulting in the formation of extensive brackish and freshwater wetlands (Atwater 1980, 1982; Goman and Wells 2000; Shlemon and Begg 1975; Wells and Goman 1995). Many of the wetlands, however, were relatively short-lived as sediment deposition began to equal or out-pace the rate of sea-level rise in the Delta (Atwater 1980, 1982; Atwater et al. 1977), totaling about five meters (16.4 feet) during the middle Holocene, between 7000 and 4000 cal BP (Figure 7). These processes ultimately buried the pre-Delta area and the lower reaches of channels draining the Central Valley (Brown and Pasternack 2004, 2005; Norris and Webb 1990).

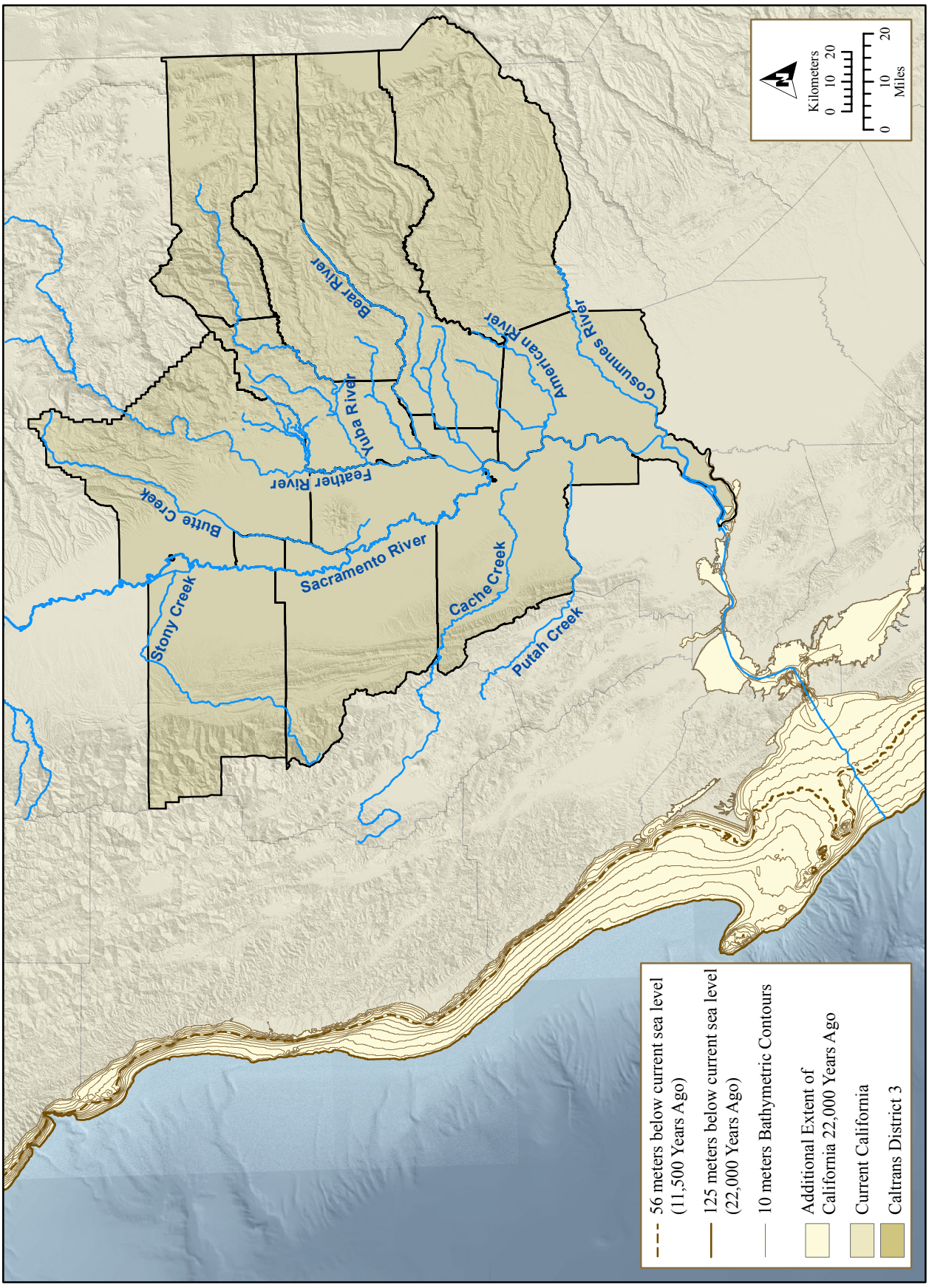


Figure 6. Maximum Extent of Sea-Level Lowering in Central California during the Last Major Glacial Period.

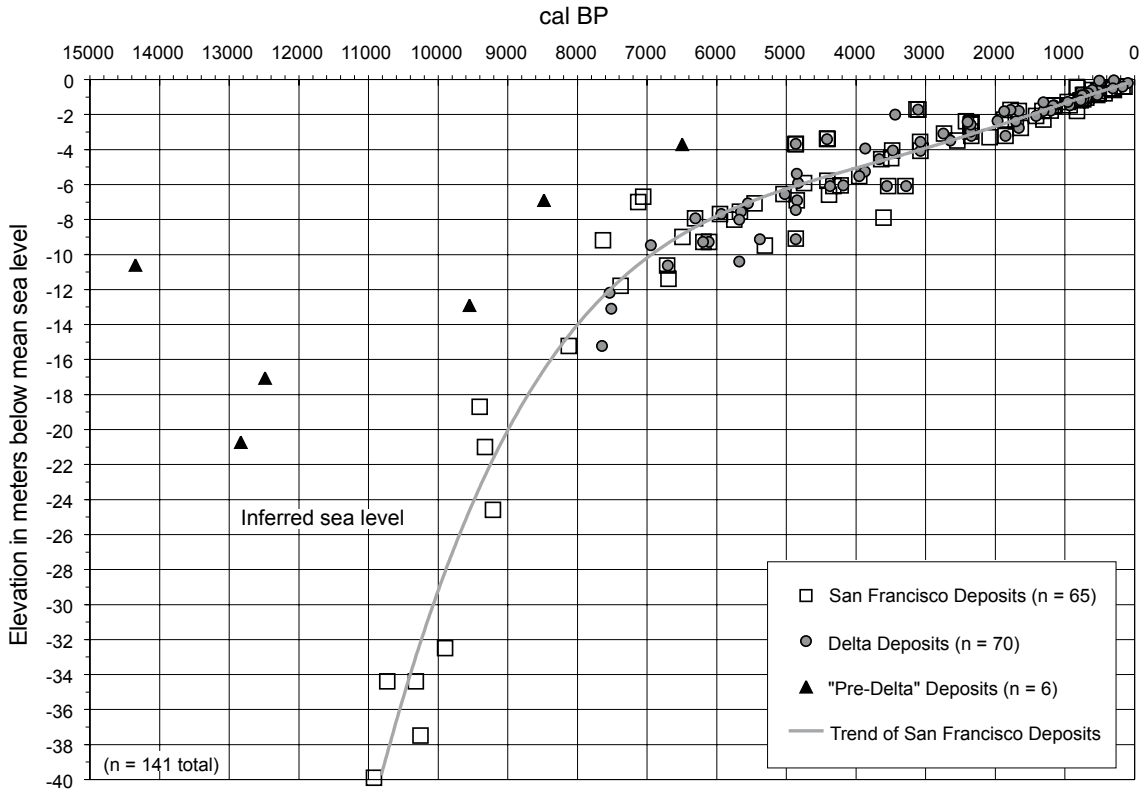


Figure 7. Rate of Sea-Level Rise Inferred from Central California Radiocarbon Dates.

During the late Holocene (i.e., the past 4,000 years), the sea rose another five meters (16.4 feet) at a relatively slow average rate of 1.25 meters (4.1 feet) per 1,000 years. As the sea progressed inland, the Delta expanded in response to the decomposition, compaction, and subsidence of wetland deposits (Figure 8). Even so, studies in District 3 suggest that dry uplands, riparian forests, and freshwater wetlands persisted in and around the northern Delta until it "gradually came under tidal influence 3000-800 cal BP" (Brown and Pasternack 2005). Thus, the outer part of the present-day Delta was probably not affected by tidal conditions until the late Holocene.

Most of the flooding and deposition in the Delta is now controlled by an extensive network of man-made levees, canals, and drainage ditches (Ingebritsen et al. 2000). Agriculture and land reclamation efforts in the region have caused the rapid decomposition of the once water-saturated peat deposits, which has resulted in land subsidence of as much as ten to 15 feet (three to 4.6 meters; Atwater and Belknap 1980). Consequently, some older (pre-Delta?) and previously buried floodplain and eolian deposits are now exposed at the Delta's surface (Atwater 1982:8; Gilbert 1917).

Lower Sacramento Valley Depositional History

The formation and growth of the Delta had a profound influence on the paleohydrology and depositional history of the lower Sacramento Valley. The rising base level of the Delta caused the lower reaches of many channels to migrate laterally as they became filled with sediments (Brown and Pasternack 2004, 2005). The Sacramento River responded by creating a wide floodplain belt that is now marked by numerous abandoned channel meander loops (i.e., oxbow lakes) and cut-off chutes, along with the active channel (Brice 1977; Robertson 1987). Evidence from a small oxbow lake in Glenn County (Little Packer Lake) suggests the river's present meander belt was established by at least 4560 cal BP, and that Little Packer Lake was created when the river cutoff that loop around 750 cal BP (Sullivan 1982). Many meander loops were partly or completely filled by sediments deposited from multiple large floods that occurred during the late Holocene (Sullivan 1982).

During major flood events in the valley, alluvium spilled over the channel banks and on to the surrounding fans and floodplains, sometimes forming prominent levee ridges (Atwater 1980:91, 93; Bryan 1923:28-29; Hinds 1952:147) such as those found along the lower Sacramento River, and on fans formed by streams draining the valley's west side, such as Cache and Putah creeks (for example, Figure 9). Once formed, the natural levees were flooded less frequently because they stood well above the surface of the surrounding flood basins.

The presence of natural levees along existing channels and at the surface of alluvial fans graded to near-modern base lines, suggests that many were formed during the late Holocene. Two major episodes of alluvial deposition are recorded in a natural levee deposit along the river's Colusa reach, one between 1550 and 1180 cal BP, and the other between 750 and 650 cal BP (White 2004:125). Radiocarbon dates from alluvium along Honcut Creek also indicate that depositional pulses and "minor" alluvial reworking occurred between about 1900 and 1200 cal BP, and between 700 and 550 cal BP, which buried many A-horizons (older land surfaces; Busacca et al. 1989:41). Around the same time, one or more large floods occurred along the South Fork American River between 1125 and 650 cal BP (Bureau of Reclamation 2002:34). Thus, a considerable amount of sediment was deposited in the low-lying portions of the valley during the late or latest Holocene.

In the Llano Seco area east of the Stony Creek fan, a well-defined network of braided "paleochannels" and channel bars was formed by multiple cycles of flooding, erosion, and deposition along the east side of the Sacramento River (Figure 10). The channels in the western part of this network are associated with a "subrecent floodplain" that has a "fresher appearance" than the channels to the east (Robertson 1987:18, 45). Although Robertson suggests the channels were created some 450,000 to 150,000 years ago by glacial and/or neotectonic activity, even "a small increase in sediment load could produce a significant shift in stream pattern" given the unstable morphology of the present river (Robertson 1987:v). Since it appears that substantial meandering and scouring along the upper reaches of the Sacramento River was later "mediated by lateral (sediment) accretion after 4,500 BP" (White 2004:124), some of the braided paleochannels could have formed during the early or middle Holocene.

Historic-Period Flooding and Deposition

During the height of the gold rush in the late 1800s, hydraulic mining in the northern Sierra Nevada

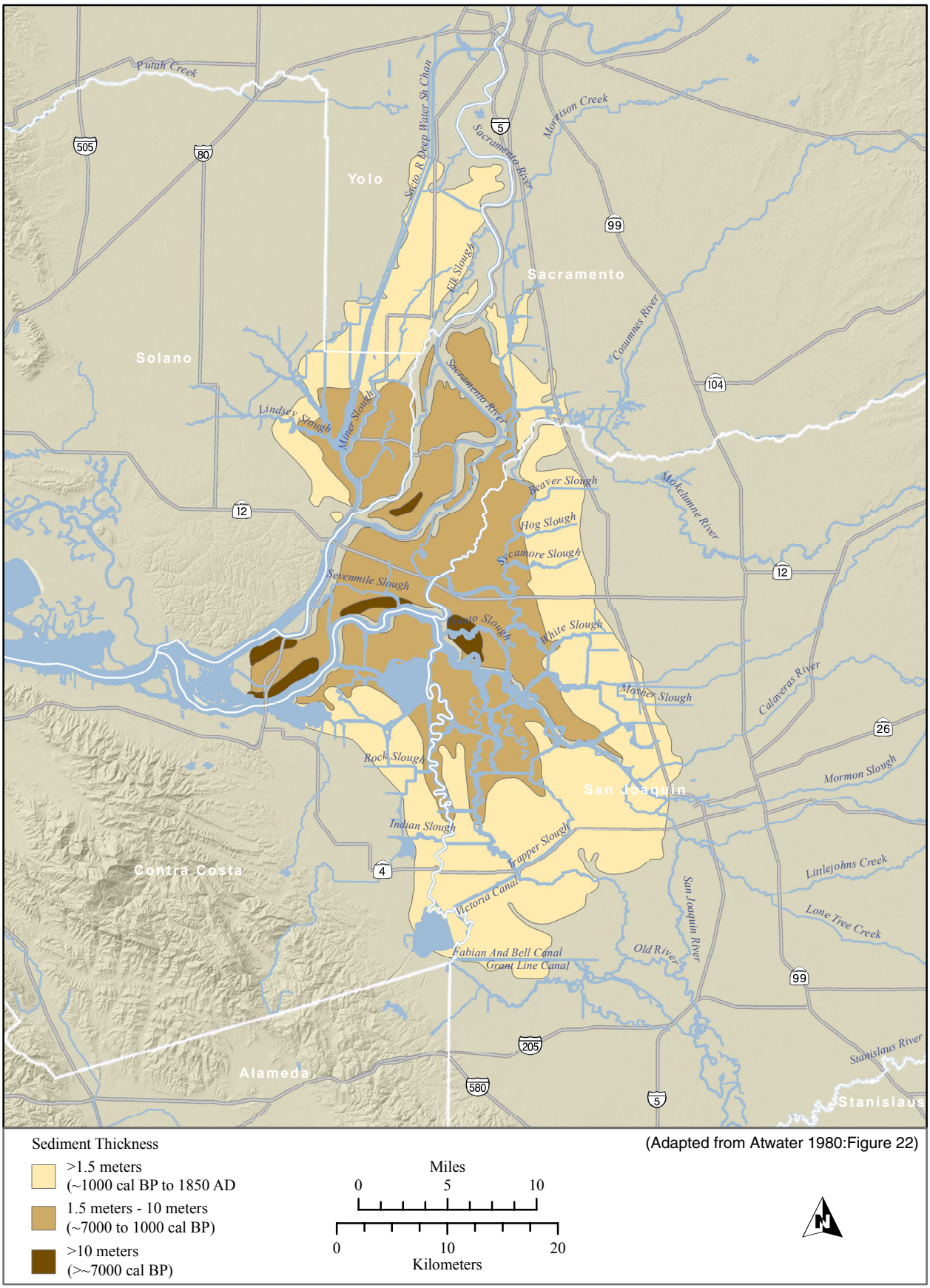
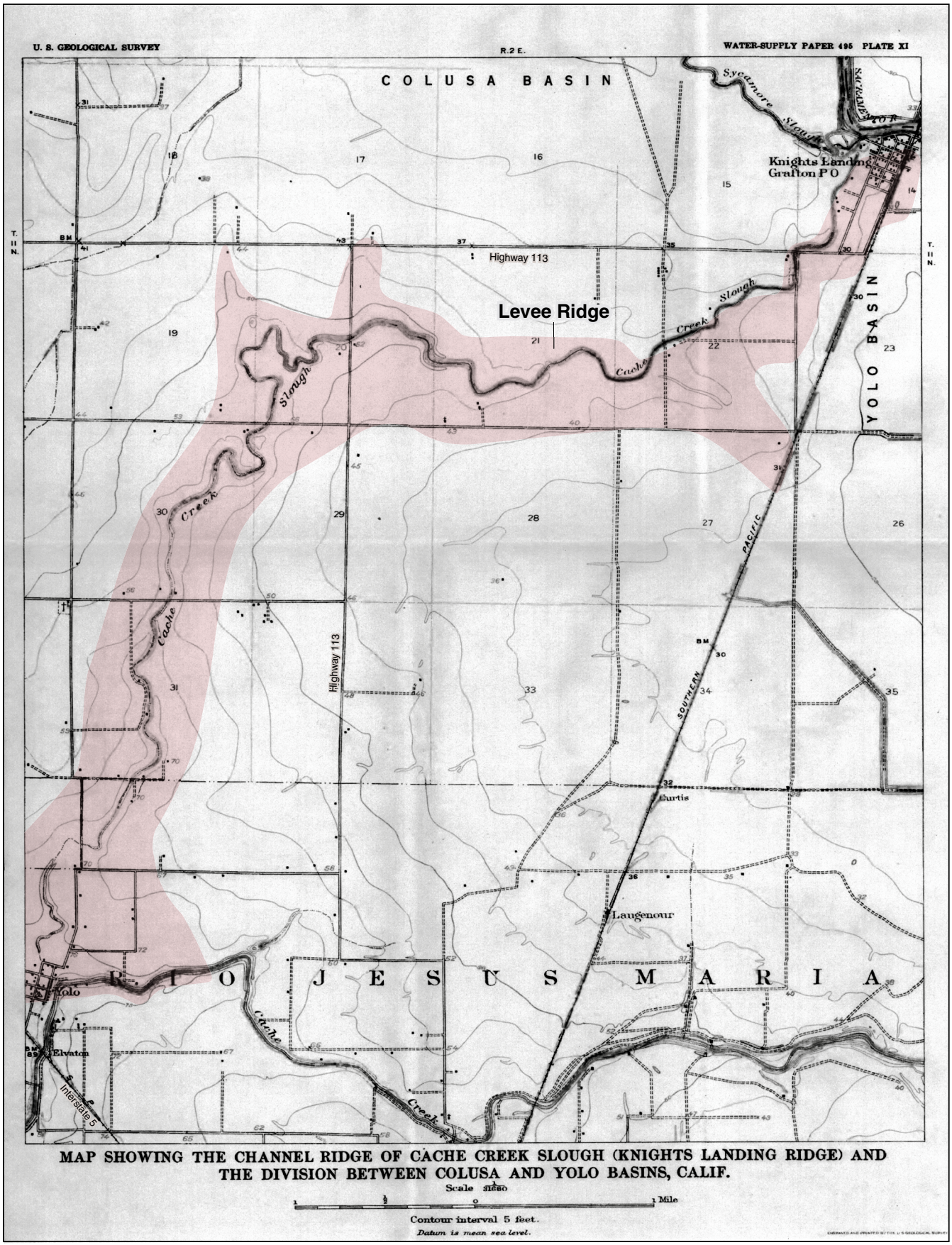
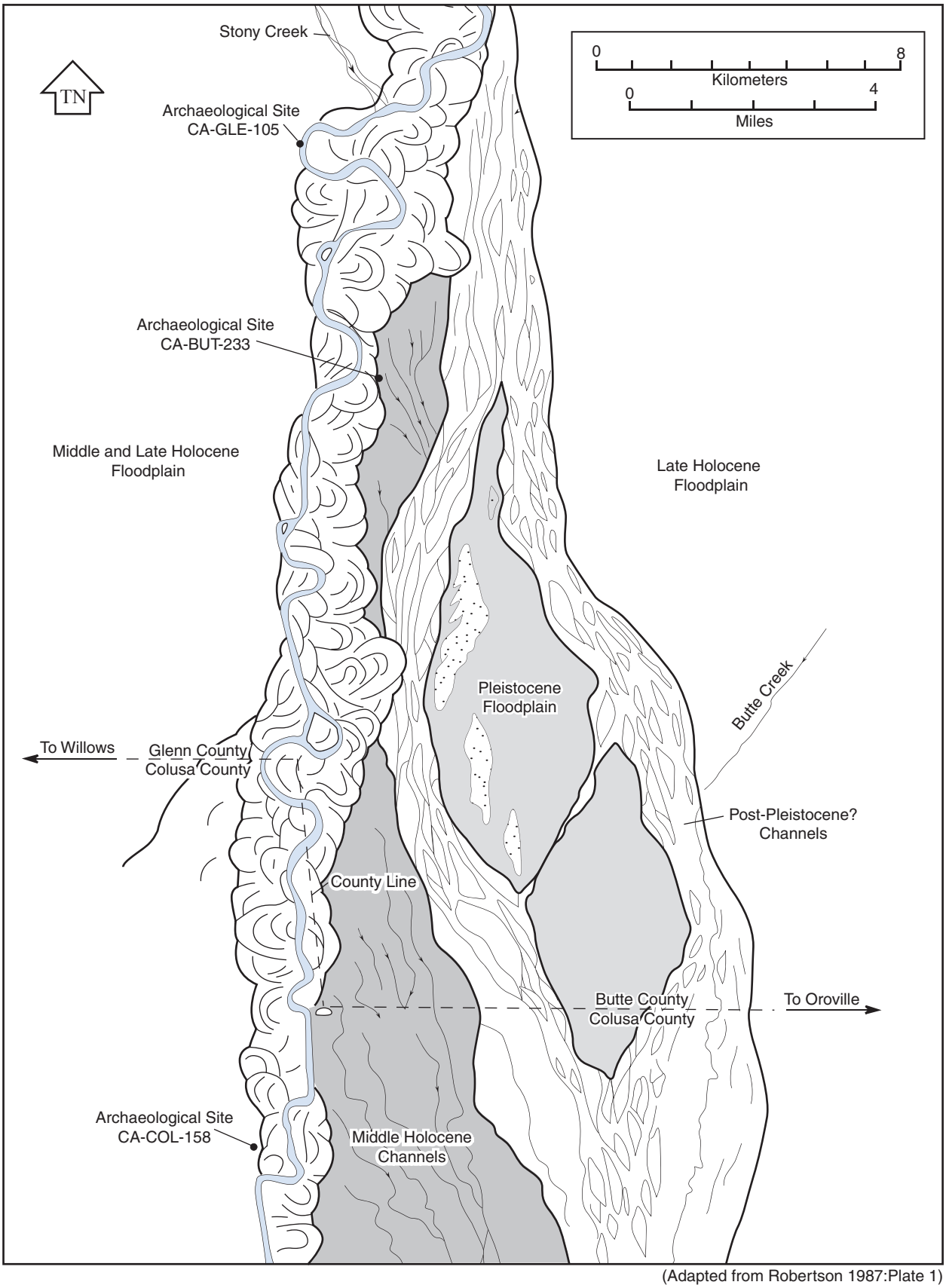


Figure 8. Holocene Evolution of the Sacramento-San Joaquin Delta Region.



(Note: Highway 113 and the division between the Colusa and Yolo basins) (Adapted from Bryan 1923:Plate XI)

Figure 9. Levee Ridge of Cache Creek Slough in Yolo County.



(Adapted from Robertson 1987:Plate 1)

Figure 10. Network of Paleochannels along the Sacramento River in District 3.

generated nearly one billion cubic meters of sediment that was released into channels draining the western slope (Gilbert 1917; Figure 11). In some mining districts, these sediments were as much as 40 meters (~130 feet) thick in the late 1870s (Whitney 1880). During the winter of 1861-1862, a large volume of these deposits was transported to the valley floor (James 1989:573) when a series of storms delivered unusually heavy rainfall, creating a "great inland lake of ice-cold muddy water" that covered most of the Sacramento Valley (Engstrom 1996:143). Intensive mining in the drainages of the Feather, Yuba, Bear, American, and Cosumnes rivers caused rapid channel aggradation in the lower reaches of these drainages, which temporarily raised many channel beds 3.0 to 4.5 meters (~10 to 15 feet) or more above their former elevations (Gilbert 1917; James 1989; Lindgren 1911; Olmstead and Davis 1961:20). Not surprisingly, this caused extensive flooding, channel migration, and widespread sediment deposition throughout the lower portions of the Sacramento Valley (Thompson 1961; Figure 11). The towns of Marysville and Yuba City, located near the confluence of the Feather and Yuba rivers, were particularly hard hit by flooding and sediment deposition before they were surrounded by a levee system.

While the influence of ocean tides once extended to near the mouth of the Feather River before the gold rush (Gilbert 1917:15), mining deposits raised the bed of lower Sacramento River to the point where tides currently reach only a short distance north of Sacramento. Repeated flooding near the confluence of the American and Sacramento rivers forced the city of Sacramento to raise its levees and overall elevation of the downtown by 3.0 meters (~10 feet) or more (Gilbert 1917). Though some mining sediments were completely removed by recent erosion, large amounts are still stored in many of the region's floodplains, and continue to be reworked by active channels (James 1991, 1999). For instance, as much as 5.1 meters (16.7 feet) of mining sediment now cover the pre-mining surface in the lower Bear River (Figure 12; James 1989:576).

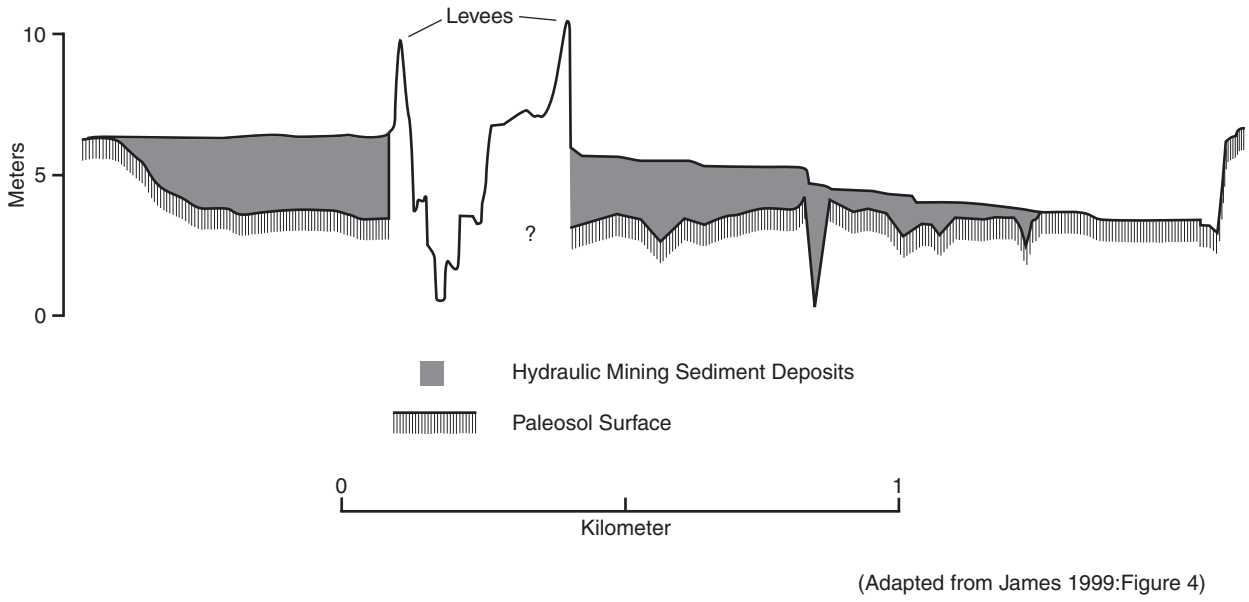
Besides the effects of mining, other historic-period activities, such as logging, livestock grazing, agricultural activities, and the replacement of native plants by invasive nonnative species caused significant environmental changes that promoted erosion and deposition (West 1989). During the 1880s, for example, the combination of over-grazing and intense drought conditions severely reduced the protective vegetation cover, which left the landscape highly susceptible to erosion (Burcham 1982:171). This erosive period caused deep gullies and channels (i.e., arroyos) to form in many valleys across the American West (Bryan 1925; Schumm and Hadley 1957), including parts of the Central Valley. Thus, just as the flood of hydraulic mining debris was nearing its end, it was partially remobilized by channel incision initiated by lower stream flows (James 1997, 1999). Some redeposited sediment now forms one or more low terraces along many of the streams and rivers in the region. These human-induced changes were accompanied by dramatic shifts in the location and sinuosity of the Sacramento River, as simple comparisons of historical and modern maps clearly reveal (Brice 1977; Larsen et al. 2002; Robertson 1987). These man-made changes have fundamentally altered the drainage system and the transport, deposition, and storage of sediment within the valley (Mount 1995).

Owing to this long series of geologic processes, the floor of the Sacramento Valley is currently characterized by:(1) elevated areas of dissected older alluvium that are located around the valley margins; (2) gently sloping areas of younger alluvial fans and floodplains located around the outer edges of the valley floor; (3) low-lying basins and overflow lands, including the Delta; and (4) active channels and floodplains (Figure 13). The chronostratigraphy of these landforms is examined in Chapter 3.

CONTEMPORARY CLIMATE

The climate of central California is zonally sub-tropical (33-42° north latitude) or Mediterranean (Major 1977), with hot dry summers and cool humid winters (Figure 14). The interaction between atmospheric zonal circulation and topography provides the primary control for the region's climate. A dominant influence is the cyclical shift in latitude and intensity of the semi-permanent Pacific High pressure cell (Anderson 1990; Hornbeck 1983; Major 1977). In the winter, as the Aleutian Low moves from its North Pacific position towards the equator, the Pacific High is pushed southward, and places California in line with low pressure systems brought by westerly winds. A reduced ocean-to-land temperature gradient allows storms originating in the Pacific Ocean to move onshore, bringing widespread precipitation to the state. In the montane zone, most winter moisture occurs as snow. Beginning in the late spring, rapid heating of the continent creates a greater temperature gradient between the ocean and land. The Pacific High pressure cell intensifies and moves northward, obstructing

Figure 11. Hydraulic Mining and Flooding of the Sacramento Valley.



(Adapted from James 1999:Figure 4)

Figure 12. Thickness of Hydraulic Mining Sediment in the Bear River Floodplain.

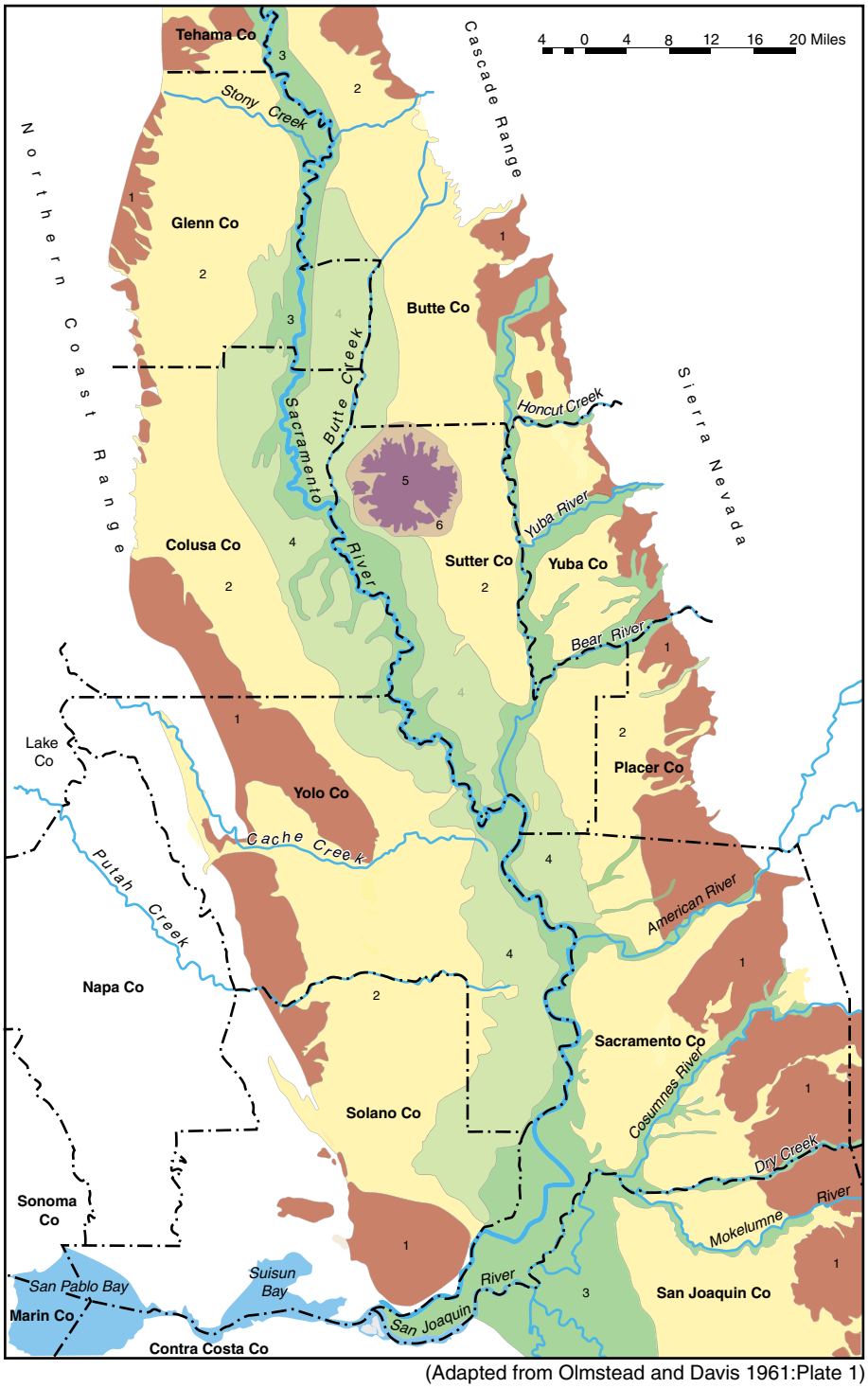


Figure 13. General Landform Groups in the Sacramento Valley.

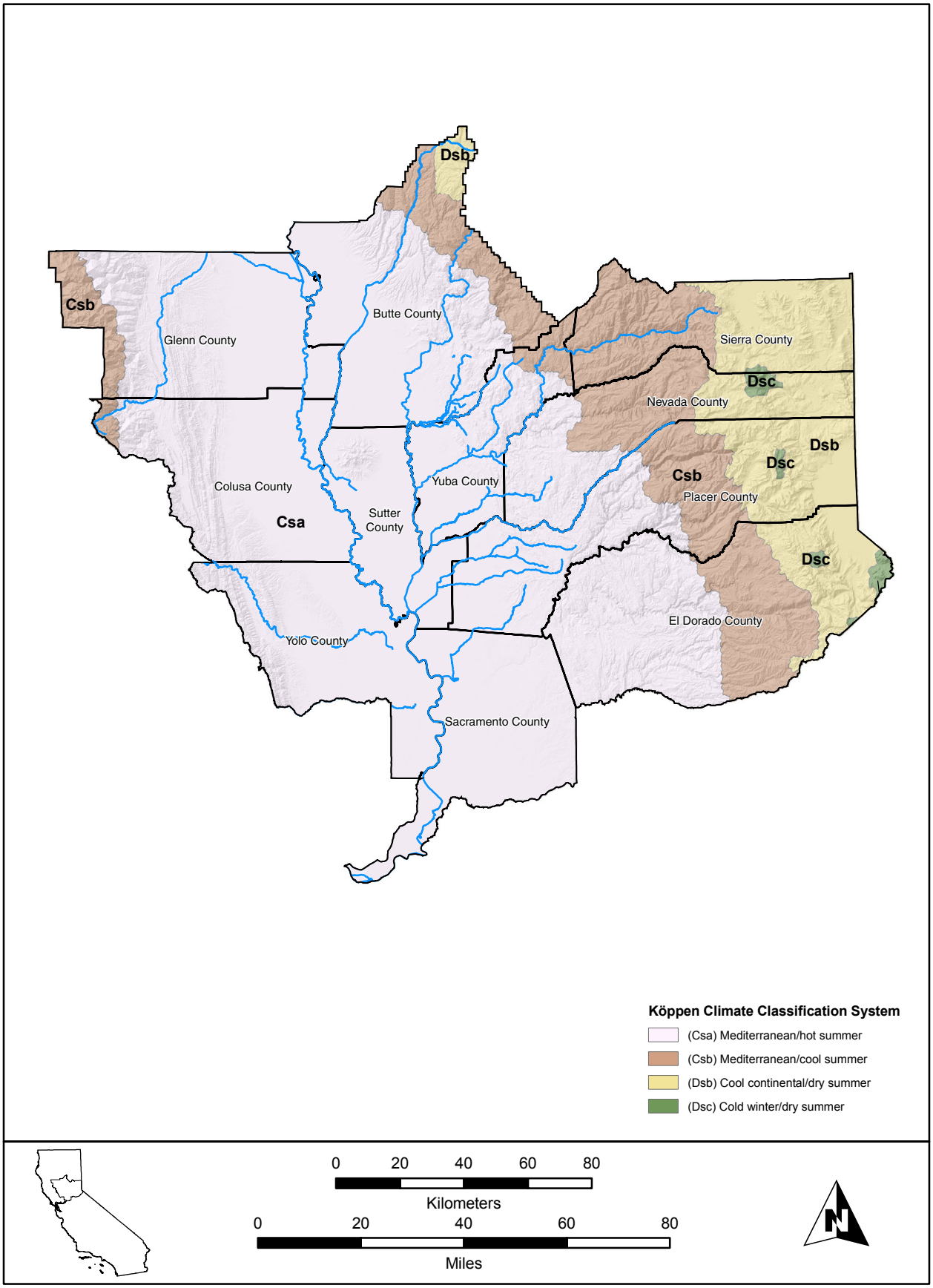


Figure 14. Climate Zones in District 3.

Pacific air masses from moving onshore, which in turn creates dryer conditions in the summer. During these months, precipitation is mainly limited to occasional convective thunderstorms and sporadic rainfall from fronts originating to the south in the Gulf of California, or to the southwest in the Pacific Ocean (Anderson 1990).

Topographic relief also has a strong effect on patterns of temperature and precipitation in California. The Sierra Nevada serves as a barrier to extremely cold winter air from the Great Basin. Cold winds that do make it over the Sierra are compressionally heated and dried, becoming the Santa Anas of southern California and the "northers" of the Central Valley (Hornbeck 1983). The Coast Ranges also serve as a buffer to the thick marine layer that mediates temperatures along the California coast (Major 1977). During the summer and fall, warm inland valleys draw the cool, moist marine air through gaps in the Coast Ranges, reducing temperatures in regions east of these openings. More significantly however, the coastal and interior mountains have an important effect on precipitation. Due to the north-south orientation of the Coast Ranges and Sierra-Cascade range, the prevailing westerly winds are cooled as they rise to overcome the mountain crests, causing them to release heavy moisture. This results in large amounts of rain and snow on the windward, west-facing slopes of the mountains, but creates a rainshadow on the east sides. Consequently, semi-arid conditions prevail on the eastern side of the Coast Ranges and in the western Sacramento Valley, and semi-arid to arid conditions occur in the Great Basin east of the Sierra-Cascade Range.

Sierra Nevada and Southern Cascade Ranges

Much of the current study area falls within the foothills and upper montane regions of the Sierra Nevada and Southern Cascade ranges, including portions of El Dorado, Placer, Nevada, Yuba, Sierra and Butte counties. The Sierra Nevada-Cascade range forms a boundary between the cool, moist Pacific air masses from the west and the warm, dry continental conditions of the Great Basin to the east. Climate is Mediterranean, with warm dry summers followed by wet, cool winters (see Figure 14). Extreme annual variation in temperature and precipitation is characteristic of this region. A combination of eastward-moving storm systems and strong west-to-east elevational gradients result in a general pattern of increasing precipitation and decreasing temperature with rising elevation (Figure 15). Moisture-laden winter storms release large amounts of rain and snow as they ascend the western slope, leaving the eastern flanks of the range with little precipitation (Major 1977).

Mean annual rainfall in the lower foothills of the western slope ranges from approximately 21 to 30 inches (Figure 15), while at mid-elevations average rainfall increases to about 46 inches. Above about 3,500 feet (1,067 meters), most precipitation occurs as winter snow, with annual maximum depths averaging as much as 400 inches or more. Above about 8,000 feet (2,438 meters), precipitation decreases to the crest and continues to decline eastward (Curry 1969; Major 1977). Snow blankets the highest peaks and alpine zone from November through May, with periodic snowfall recorded annually to elevations as low as 2,300 feet (701 meters) amsl. Although most of the yearly precipitation occurs between November and April, convective thunderstorms originating from the south are common at mid- to high-elevations in the Sierra-Cascade Range during summer months, and contribute a measurable amount to yearly rainfall totals.

In the foothills, the warmest months of the year are July and August with average maximum daily temperatures ranging from about 91 to 97 degrees Fahrenheit (°F; 50.6 to 53.9 degrees Celsius [°C]). At higher elevations, it is somewhat cooler, with maximum daily temperatures in the summer averaging in the low to mid-80s (°F [mid-40s °C]). Coolest conditions prevail at the highest elevations, where summer high temperatures average about 70 °F (38.9 °C). Between December and February, maximum daily temperatures at upper elevations are quite low, averaging just 37 to 39 °F (20.6 to 21.7 °C). The foothills are mild by comparison, with maximum daily temperatures in December and January averaging between 50 and 65 °F (27.8 and 36.1 °C). Most mid-elevation localities have average maximum daily winter temperatures in the low to high 40s (°F [22-26 °C]).

Coast Ranges

Only a small portion of the study area coincides with the eastern edge of the Coast Ranges in western Yolo, Colusa, and Glenn counties. Like the adjacent Sacramento Valley, the eastern slope of the North Coast Range is often quite hot and dry in the summer, with mean annual maximum temperatures typically in the low nineties (°F). The constraining mountains restrict cool marine air from the west, causing temperatures in the summer to be

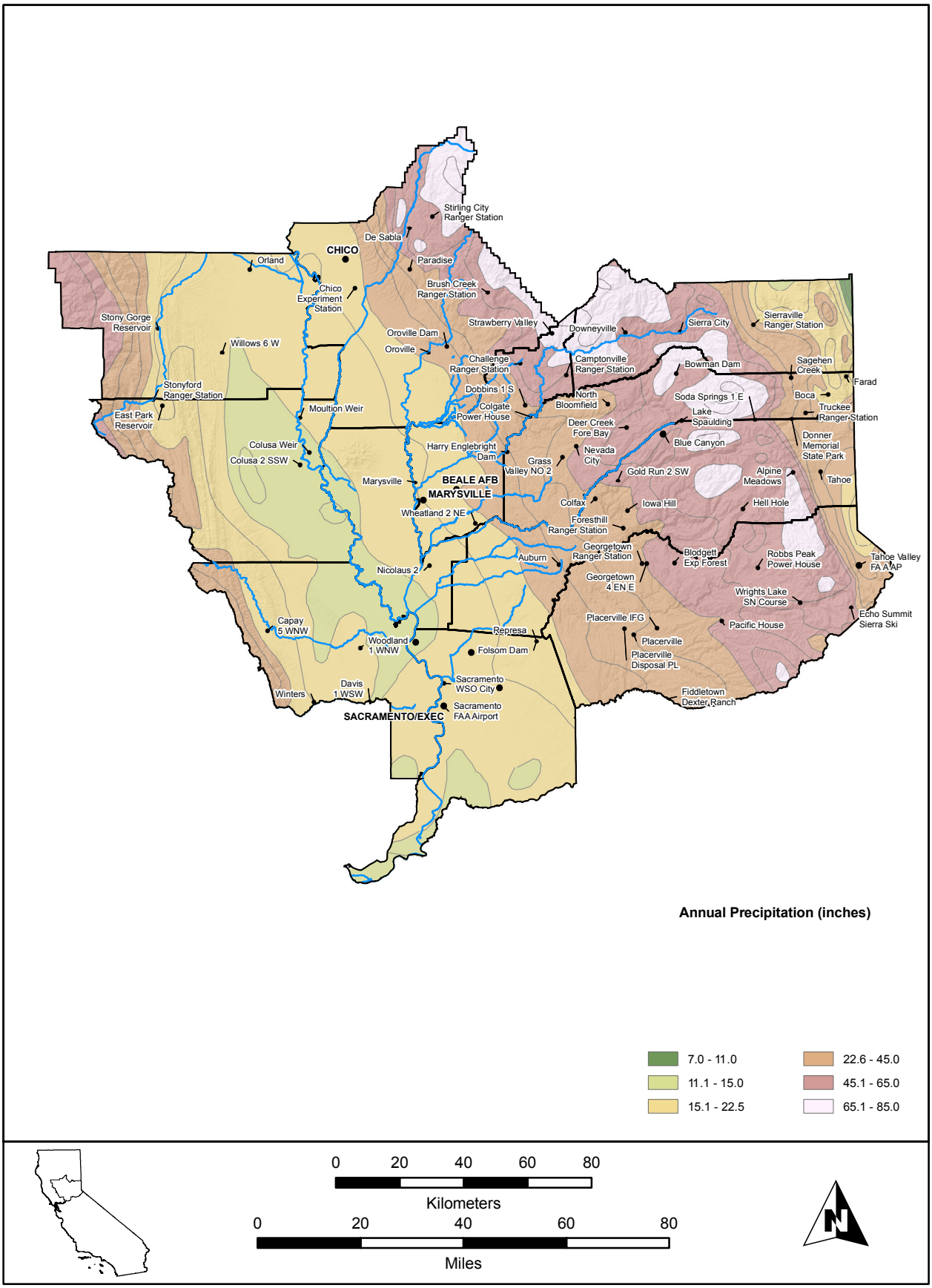


Figure 15. Annual Precipitation in District 3.

considerably warmer on the east side of the range than those in the interior valleys farther to the west; in the winter the opposite is true. The moderating effect of marine air does not penetrate the Coast Range and it is typically colder on the eastern slope, with mean minimum annual temperatures of about 30 °F (16.7 °C) in the higher mountains and 34 °F (18.9 °C) in the foothills (Begg 1968). Average annual precipitation in the mountainous uplands of the North Coast Ranges can reach as much as 60 inches (Begg 1968), while foothill regions in the rain shadow to the east typically average only 15 to 16 inches (see Figure 15). At higher elevations, a good portion of the annual precipitation occurs as snowfall with an estimated total between 50 and 75 inches (Begg 1968).

Sacramento Valley

Roughly 30% of the current study area falls within the Sacramento Valley, including most or all of Sacramento and Sutter counties. Summer days in this region often exceed 100 °F (55.5 °C) with maximum average temperatures ranging between about 95 °F (52.8 °C) in the northern portion of the valley to about 90 °F (50 °C) farther south, near the Delta. Along the southern end of the valley, prevailing westerly winds push moisture-laden marine air through the Carquinez Strait gap, resulting in cooler summer temperatures and a longer frost-free period than is typical of regions to the north (Reed and Romito 1992). In the winter, maximum average temperatures in the valley range between 52 and 54 °F (28.9 and 30 °C). Approximately 90% of annual rainfall occurs during the winter half of the year, between November and April; more than 50% occurs in December, January, and February. The summer months of June, July, and August are the driest of the year, with only about one percent of average annual rainfall originating from periodic thunderstorms during this season.

The orographic effect of the Coast Ranges produces clear geographic variation in annual precipitation across the valley, with a high of more than 27.7 inches at Oroville on the eastern side of the basin, to a low of 16.4 inches at Dunnigan on the western edge of the valley (see Figure 15). A north to south precipitation gradient also exists in the Sacramento Valley, resulting in an average of 21.3 inches of precipitation at Orland to the north and an average of 16.9 inches at Clarksburg to the south.

From December to March, ground fog is common in the valley. Under stable atmospheric conditions, cool air from the surrounding mountains and radiational cooling can result in fog that persists for days or even weeks (Reed and Romito 1992). Along the rivers and sloughs, light fog is common during cool, wet periods, usually dissipating early in the day.

HYDROLOGY

The Sacramento River watershed is the largest in California, covering 26,548 square miles. It carries 31% of the state's total freshwater runoff (Carle 2004), receiving input from tributaries draining a broad area of northern California, including the eastern slope of the North Coast Ranges, the Klamath Mountains, the Modoc Plateau, the Southern Cascades, and the northern Sierra Nevada. However, due to the orographic effect of the mountain ranges, the great majority of fresh water originates from the western slope of the Sierra-Cascade Range. In the northern portion of the study area, the Feather River and its main tributaries (the Yuba and Bear rivers) are the main source of run-off. The American River drains a large part of the study area to the south, while north of the Feather River, the Sacramento is fed by a number of smaller tributaries originating on the western slope of the Cascades, including Butte, Big Chico, Deer, Mill, and Antelope creeks. The Coast Ranges contribute just 8% to the total Sacramento River flow. The primary tributaries from the west side of the valley include Elder, Thomes, Stony, Cache, and Putah Creeks.

In upland portions of the study area, rivers and streams are confined to relatively straight, narrow, bedrock-controlled channels surrounded by steep slopes. These are typically high-gradient watercourses with little or no floodplain development (Bay Institute 1998); however, localized accumulations of deep sediment are found along those drainages passing through upland valleys such as Sierra and Martis. In the foothills of the Sierra-Cascade and Coast ranges, stream gradients lessen, and narrow floodplains and alluvial terraces occur along active channels. Due to swift water flows, stream beds in the foothills region are composed mainly of gravel and small cobbles.

In the Sacramento Valley above Colusa, the relatively steep gradient of the Sacramento River forms a wide meander belt as the channel migrates back and forth, creating a series of oxbow cutoffs, sloughs, side channels, and distributary channels. As the gradient decreases south of Colusa, the Sacramento River remains

sinuous, but active channel migration occurs less often. In this stretch, the river bed gradually changes from gravel to sand, and laterally extensive depositional levees have developed along the river banks (Bay Institute 1998). Approaching the Sacramento Delta, the river gradient decreases even further; historically, this led to seasonal flooding of large portions of the lower valley. Often exceeding 20 feet deep, these regular floods caused the deposition of sands and silts which formed extensive natural levees up to several miles wide and rising as much as ten to 23 feet above the river (Bay Institute 1998:2-22).

Natural levees also confined lateral deposition of river-borne sediments creating a series of parallel, low-lying basins between the margins of active floodplains and alluvial fans flanking the Coast Range and Sierra-Cascade Range. Due to the size of the natural levees, many of the tributary streams, including Cache Creek and Putah Creek, had no direct connection to the Sacramento River; instead, they emptied directly into the adjacent flood basins. This caused an extensive parallel drainage system to develop in the valley bottom, as water trapped in low-lying areas worked its way to the river via downstream entry points, such as Cache Slough (Bay Institute 1998:2-44). At least six separate, topographically distinct flood basins once existed in the Sacramento Valley covering as much as 1,000 square miles (Bay Institute 1998). East of the Sacramento River, the valley was divided into four topographically distinct basins: Butte, Sutter, American, and Sacramento. West of the Sacramento River, two basins existed: Colusa and Yolo. These low-lying regions could hold an estimated four million acre-feet of water during seasonal flood events when the Sacramento River over-topped its levees. Low areas along the levees allowed river water to enter the basins annually even when flows were not high enough to spill over elevated sections of these landforms. The basins would remain flooded for extended periods, until the water evaporated or until summer, when the water level in the river fell below the level of the flood basin (Bay institute 1998:2-43).

At its lowest reaches, the Sacramento River merges with the tidally influenced Sacramento-San Joaquin Delta. In its pre-developed state, the Delta consisted of a sinuous mosaic of interconnected sloughs, overflow lakes, natural levees, and subtidal islands formed around the confluence of the Sacramento, San Joaquin, Mokelumne, Cosumnes, and American rivers. A narrow constriction at its outlet between the Diablo Range and Montezuma Hills has caused the Delta to prograde basinward over the last 6,000 years in response to global sea-level rise.

A direct connection with the salt-water environments of San Francisco and San Pablo bays creates a salinity gradient from west to east in the Delta which changes in response to daily tidal cycles and seasonal variations in freshwater run-off. Historically, during the winter and spring, high river flows inundated much of the Delta with fresh water, while during the late summer and fall, reduced fresh water flows caused salt water from the bay to move inland as far as Stockton (Shlemon and Begg 1975; West 1977). Between about 1860 and 1920, construction of an extensive series of levees, dikes, and tidal gates had drained much of the Delta wetlands and brought more than 50 reclaimed tracts and islands into intensive cultivation. By 1930, more than 441,000 acres of wetlands had been drained in the Delta (West 1977; West et al. 1999).

THE BIOTIC LANDSCAPE

The physiography of the study area produces a diverse array of habitats corresponding to differences in elevation, precipitation, and temperature. From the low elevation wetlands of the Sacramento Valley and Delta region, open woodland and grassland prairie stretches to the lower slopes of the Coast Ranges and Sierra-Cascade foothills (Figure 16). From there, blue oak-grey pine woodland and chaparral communities dominate both sides of the valley to around 3,000 feet (914 meters). In the Sierra Nevada, montane conifer forest creates a thick canopy to about 8,000 feet (2,438 meters) amsl, after which, open subalpine forest gives way to a treeless alpine zone above 10,000 feet (3,048 meters) amsl. Conifer forests also occur at higher elevations of the Coast Range, but are restricted in the current study area to western Glenn County. In the following section we briefly describe the major plant and animal communities associated with these different physiographic regions, emphasizing those species which appear to have been the most important to Native subsistence economies.

Montane Forests

Currently, the lower montane forest of the Sierra Nevada-Cascade Range forms a continuous belt running along the western slope from about 3,000 to 7,000 feet (915 to 2,135 meters) in elevation (Figure 16).

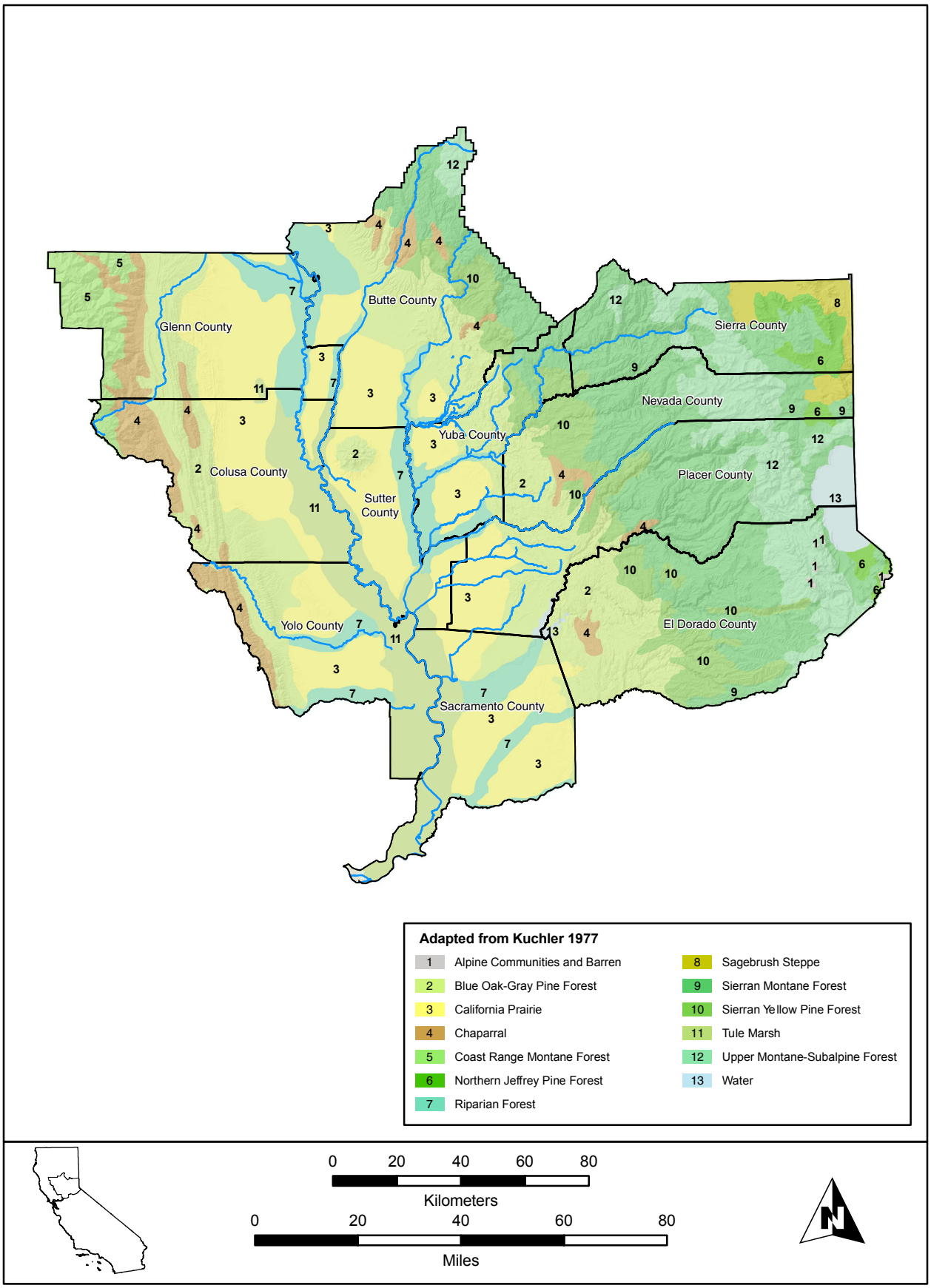


Figure 16. Historical Natural Vegetation in District 3.

Ponderosa pine (*Pinus ponderosa*) is dominant throughout this community in xeric settings, along with incense cedar (*Calocedrus decurrens*), while white fir (*Abies concolor*) is the primary species found in mesic localities, frequently accompanied by sugar pine (*Pinus lambertiana*). Black oak (*Quercus kelloggii*) commonly grows in dry, open areas of the forest or along the fringes of dry meadows, primarily associated with stands of ponderosa pine and incense cedar. Big maple (*Acer macrophyllum*), dogwood (*Cornus nuttallii*), manzanita (*Arctostaphylos* spp.), ceanothus (*Ceanothus* spp.), and bear clover (*Chamaebatia foliolosa*), are regular constituents of the understory. At its lower limits, the mixed conifer forest interfingers with foothill woodland and chaparral communities, and at its upper limits with conifers associated with the upper montane forest. Endemic to the western slope of the Sierra, giant sequoias occur in small groves scattered over a 420-kilometer-long (260-mile-long) belt in the central Sierra, with the northernmost grove occurring in District 3, at the bottom of the American River Canyon in Placer County (Griffin and Critchfield 1972).

Above about 7,000 feet (2,135 meters), the upper montane forest is dominated by red fir (*Abies magnifica*), often found in pure stands. At lower elevations, a common associate is white fir, and at higher elevations lodgepole pine (*Pinus contorta*) is commonly intermixed. Other frequent associates include white pine (*Pinus monticola*), sugar pine, Jeffrey pine (*Pinus jefferyi*), and mountain hemlock (*Tsuga mertensiana*). In exposed areas with rocky substrates, Sierra juniper (*Juniperus occidentalis*), and ponderosa pine may be found. Just above the red fir zone, the dense forest canopy opens and lodgepole pine becomes dominant. Meadows are most common in the upper montane forest, although they occur throughout the lower and subalpine forest, as well as in the alpine zone. These environments range in size from a few square meters to several hundred hectares. In the wet meadows of the western slope, perennial grasses (*Poa* and *Bromus* spp.), sedges, and rushes dominate. Dryer woodland meadows frequently include a ground cover of grasses and forbs with scattered lodgepole pine and stands of willow (*Salix* spp.), aspen (*Populus tremuloides var. aurea*), and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*; Rundel et al. 1977).

Beginning about 9,500 feet (2,900 meters), the subalpine forest is distinguished by a spare overstory of widely scattered conifers, including mountain hemlock, whitebark pine (*Pinus albicaulis*), and western white pine. Although shrubby vegetation is scattered in the subalpine zone, wax currant (*Ribes cereum*), bush oceanspray (*Holodiscus dumosus*), and sagebrush (*Artemisia californica*) occasionally occur, while willow, dwarf bilberry (*Vaccinium caespitosum*), and mountain laurel (*Kalmia latifolia*) can be found on moist sites and around meadows (Rundel et al. 1977). Beginning about 10,000 feet (3,000 meters), scattered trees of the sub-alpine forest give way to the open alpine zone, characterized by low, scattered shrubs, grasses, and cushion-plant communities. Common elements of the alpine zone include bottlebrush squirreltail (*Elymus elymoides*), pussytoes (*Antennaria* spp.), clover (*Trifolium* spp.), gentian (*Gentiana* spp.), as well as sedges, rushes, and a variety of grasses.

Only a very small portion of the current study area in Glenn County falls within the montane forest zone of the Coast Ranges. These forests are found at elevations above approximately 3,000 feet (915 meters) and typically have a dense to moderately open canopy. White fir, red fir, Douglas fir (*Pseudotsuga menziesii*), and ponderosa pine are dominant species. Sugar pine, black oak, and huckleberry oak (*Quercus vaccinifolia*) are also common in the overstory, while manzanita, bush chinquapin (*Chrysolepis sempervirens*), and whitethorn ceanothus (*Ceanothus velutinus*) are common evergreen shrubs.

Fauna of the Montane Forests

Mule deer would have been the most common large herbivore found at mid- and high-elevations on the western slope of the Sierra-Cascade and eastern slope of Coast range. Sierra mule deer (*Odocoileus hemionus*) are migratory, wintering below the snow line in the foothill woodland and mixed conifer forest and summering above 6,500 feet (2,000 meters) in the upper montane and sub-alpine forests. In mid-March or April, mule deer begin gradually moving to their summer range, arriving in mid- to late-May. During this time of year, herds are divided into matriarchal family groups and male herds composed of older bucks. In early June, fawning territories are established around meadows and shrubby habitats near water. Beginning about mid-October, family herds rapidly move downslope to winter range along traditional migration routes (Woolfenden 1988).

Bighorn sheep (*Ovis canadensis californiana*) are the only other large ungulate that would have been found in the upper elevations of the western Sierra, occurring primarily above the tree line in steep, rocky, alpine

habitats. These animals rely on excellent vision and agility in precipitous rocky settings to escape predators. As a result, forests and thick brush are usually avoided. Bighorn sheep herds are typically fragmented, with males moving between groups of independent females. Like mule deer, bighorn sheep breed in the fall and lambing season is in the spring and early summer.

Grizzly bear (*Ursus arctos*), black bear (*Ursus americanus*), and puma (*Puma concolor*) were once common in the montane forests of the Sierra-Cascade and Coast Range, along with other carnivores and omnivores including bobcat (*Lynx rufus*), grey fox (*Urocyon cinereoargenteus*), Sierra Nevada red fox (*Vulpes vulpes necator*), raccoon (*Procyon lotor*), ringtail (*Bassariscus astutus*), pine marten (*Martes americana*), fisher (*Martes pennanti*), long-tailed weasel (*Mustela frenata*), ermine (*Mustela erminea*), mink (*Mustela vison*), wolverine (*Gulo gulo*), badger (*Taxidea taxus*), and striped (*Mephitis mephitis*) and spotted skunk (*Spilogale gracilis*). Gray squirrel (*Sciurus griseus*) and ground squirrels (*Spermophilus beecheyi*) are residents of the montane zone as are porcupine (*Erethizon dorsatum*), woodrat (*Neotoma* spp.), several species of chipmunks (*Eutamias* spp.), yellow-bellied marmot (*Marmota flaviventris*), and several members of the gopher (Geomyidae), rat (Muridae), and mice (Cricetidae) families. Hares and rabbits found in the Sierra include snowshoe hare (*Lepus americanus*), white-tailed jackrabbit (*Lepus townsendii*), black-tailed jackrabbit (*Lepus californicus*), and brush rabbit (*Sylvilagus bachmani*). River otter (*Lutra canadensis*) and beaver (*Castor canadensis*) would have been found in riparian communities. Rainbow trout (*Oncorhynchus mykiss*) are native to streams throughout the elevational range of the Coast Range and in streams and lakes below 6,000 feet (1,830 meters) in the Sierra. No fish are native to the higher elevations of the Sierra, although introduced species now reside in these habitats (Moyle 2002). In streams and rivers at lower elevations, rainbow trout, sculpin (*Cottus* sp.), and speckled dace (*Rhinichthys osculus*) were once common (Moyle 1976). Several types of hawks (*Buteo* spp.), eagles (*Aquila* spp.), and owls (Strigidae) are indigenous to the conifer forests of the Sierra-Cascade Range, as are numerous other smaller birds, including the black-headed grossbeak (*Pheucticus melanocephalus*), dark-eyed junco (*Junco hyemalis*), Stellar's Jay (*Cyanocitta stelleri*), flicker (*Colaptes auratus*), hermit thrush (*Catharus guttatus*), blue grouse (*Dendragapus obscurus*), and mountain bluebird (*Sialia currucoides*), among many other species.

Sierra-Cascade and Coast Range Foothill Woodlands

In the rolling foothills surrounding the Sacramento Valley, the California Prairie gives way to open, grey pine-blue oak woodland. This community occurs on the older fans and hillslopes flanking the Coast Range and Sierra Nevada-Cascade Range between about 300 to 3,000 feet (90 and 915 meters) in elevation. The foothill woodland is dominated by California endemics including grey pine (*Pinus sabiniana*), blue oak (*Quercus douglasii*), valley oak (*Quercus lobata*), and buckeye (*Aesculus californica*). In the Sierra-Cascade Range, interior live oak (*Quercus wislizenii*) is also common, but occurs only sporadically in the foothills of the Coast Ranges, replaced by coast live oak (*Quercus agrifolia*; Griffin and Critchfield 1972). Near the prairie, the canopy opens to a savanna with pure stands of blue oak and a ground cover of forbs and perennial and seasonal grasses (Griffin and Critchfield 1972). Chaparral species are commonly intermixed throughout xeric portions of the foothill woodland, typically in areas of unfertile, rocky substrates. In the Sierra-Cascade Range, chamise (*Adenostoma fasciculatum*), manzanita, deerbrush (*Ceanothus integerrimus*), mountain mahogany (*Cercocarpus betuloides*), and wedgeleaf ceanothus (*Ceanothus cuneatus*) are all common elements of the chaparral community, along with a number of other xeric shubs, including several species of oak (*Quercus* spp.) which often form a patchy, dense, understory. Pure stands of chaparral are common in canyons and on dry, rocky slopes. At its upper limits in the Sierra-Cascades, the foothill woodland-chaparral community interfingers with the montane conifer forest. Along this boundary, pure stands of conifer are found on cool, north-facing slopes and canyons, while woodland and chaparral species occur in more arid, south-facing settings.

On the arid eastern slopes of the North Coast Range, chaparral communities are common, often forming a mosaic with woodland savanna and grasslands. Blue oak, coast live oak, and buckeye create a scattered canopy, with associated scrub-chaparral species including, chamise, manzanita, deerbrush, California buckwheat (*Eriogonum fasciculatum var. foliosum*), sagebrush, mountain mahogany, toyon (*Heteromeles arbutifolia*), holly-leaved cherry (*Prunus ilicifolia*), scrub oak (*Quercus berberidifolia*), and bush monkey flower (*Mimulus aurantiacus*).

Throughout the foothill woodlands of the Coast Ranges and Sierra Nevada, riparian communities formed lush forests along most major waterways. An over-story of California sycamore (*Platanus racemosa*) and

Fremont cottonwood (*Populus fremontii* ssp. *fremontii*) is typical, with big leaf maple, arroyo willow (*Salix lasiolepis*), narrowleaf willow (*Salix exigua*), pacific willow (*Salix lucia*), red willow (*Salix laevigata*), and white alder (*Alnus rhombifolia*) making up common elements of the sub-canopy. Grape (*Vitis californica*), blackberry (*Rubus ursinus*), and poison oak (*Toxicodendron diversilobum*) are also frequently associated with this community.

Foothill Fauna

Black-tailed deer would have been the most prominent large resident herbivore in the foothill woodland zone, with elk (*Cervus canadensis*) and pronghorn (*Antilocapra americana*) occupying only the lower oak savanna and adjacent prairie. Unlike mule deer herds at higher elevations, black-tailed deer living in the foothill woodlands of the Coast Ranges and Sierra-Cascade Range did not migrate, but instead were confined to comparatively small home ranges. Does, their fawns, and yearlings, occupied a territory some 650 meters (2,132 feet) in diameter, with older bucks having home ranges up to 1,200 meters (3,940 feet) in diameter. These territories, however, were not mutually exclusive and as many as 80 or 90 deer may have shared portions of the same home range (Dassman and Taber 1956). Large-bodied omnivores and carnivores were once found throughout the foothill woodland, including grizzly and black bear, puma, coyote, bobcat, and grey fox. Brush and cottontail rabbits (*Sylvilagus auduboni*) would have been quite common, as would a host of other small mammals. California (*Callipepla californica*) and mountain quail (*Oreortyx pictus*), grouse, flicker, Steller's jay, raven (*Corvus corax*), hawks, and eagles currently occur regularly in this community as do many other passerine birds (i.e., perching birds). Warm, shallow-water streams running through the foothill woodlands would have been home to resident California roach (*Hesperoleucus symmetricus*), but were also used for spawning by anadromous steelhead trout, and Chinook salmon (*Oncorhynchus tshawytscha*), as well as Sacramento sucker (*Catostomus occidentalis*), Western pike-minnow (*Ptychocheilus grandis*), and other native minnows (Moyle 2002). In the deeper, cooler waters of major rivers and streams, Sacramento sucker and Western pike-minnow would have been joined by rainbow trout, prickly sculpin, speckled dace, hardhead (*Mylopharodon conocephalus*), and tule perch (*Hysterocarpus traskii*; Moyle 1976).

Sacramento Valley Marshes, Forests, and Prairie

Historically, the southwestern portion of the Sacramento Valley was distinguished by the extensive wetlands of the Sacramento-San Joaquin Delta (see Figure 16). Prior to reclamation, this region was a freshwater tule marsh, covering almost 500,000 acres around the confluence of the Sacramento, San Joaquin, American, and Cosumnes rivers (Atwater 1980; Shlemon and Begg 1975; West 1977). Often dominated by pure stands of bull rush (*Scirpus* spp.), the native freshwater marsh also contained cattails (*Typha* spp.), sedges (*Carex* spp.), rushes (*Juncus* spp.), and reeds (*Phragmites communis*). Aquatic plants such as pondweed (*Potamogeton* spp.), knotweed (*Polygonum* spp.), and yellow pond lilly (*Nuphar polysepalum*) grew in areas of deeper, permanent water, such as ox-bows and other backwater habitats.

North of the Delta, non-tidal marshlands in the Sacramento Valley formed a continuous strip along the Sacramento River to approximately the modern town of Willows (Bay Institute 1998:2-39; Kuchler 1977). Extensive tule marshes were also found in the natural flood basins which occupied much of the lower valley between the narrow river levees and mountain-front alluvial fans (Bay Institute 1998; Kuchler 1977). These marshlands combined are estimated to have once covered some 300,000 acres (Bay Institute 1998).

In addition to the Sacramento River, all of the major watercourses draining the Sierra Nevada and Cascade Range, including the Cosumnes, American, Yuba, and Feather, were largely or partially flanked by broad gallery forests. Modern estimates suggest that as much as 364,000 acres of the Sacramento Valley was once covered by distinct riparian vegetation including both the Valley oak woodlands and river-bank forests (Bay Institute 1998:2-30). The breadth of these habitats varied depending on the width of the natural levees, but is thought to have ranged from as much as five miles wide along lower portions of the Sacramento River to less than one to two miles along the smaller tributaries (Bay Institute 1998; Burcham 1982; Kuchler 1977; Thompson 1961).

Riparian forests along the middle and lower reaches of these rivers often formed dense, multi-tiered canopies of primarily deciduous species (see Figure 16). The lowest terraces were occupied by a thick forest of willows and Fremont cottonwood (West 1977). On the adjacent levees and floodplains, the over-story was dominated by cottonwood, valley oak, California sycamore, Oregon ash (*Fraxinus latifolia*), and black walnut

(*Juglans nigra*). The sub-canopy commonly included white alder, box elder (*Acer negundo*), buckeye, big leaf maple, and elderberry (*Sambucus mexicana*), while the understory was composed of willows, grape vine, blackberry, poison oak, and numerous other shubs and herbaceous species forming dense thickets (Burcham 1982; Thompson 1961; West 1977).

Farther from the rivers and streams, oak woodlands formed uniform tracts up to three to five kilometers (about two to four miles) wide, consisting almost exclusively of valley oak. These forests were more common on the eastern side of the valley and often created a dense canopy. The underlying savanna was open, carpeted by native bunch and annual grasses including abundant wild rye (*Elymus triticoides*; Griffin 1977; West 1977). A sparse understory in the oak woodland also included poison oak, elderberry, buckeye, and wild rose (*Rosa californica*; West 1977).

Large expanses of the valley between the oak savanna and the lower foothills were blanketed by the open grassland of the California prairie. Covering much of the deep alluvial fans and floodplains along the valley margins, the pristine Central Valley prairie formed a thick mat of annual and perennial grasses (Burcham 1982). Perennial purple needlegrass (*Stipa pulchra*) is thought to have been a dominant species, along with nodding needlegrass (*Stipa cernua*), blue wild rye (*Elymus glaucus*), pine bluegrass (*Poa scabrella*), and deergrass (*Muhlenbergia rigens*; Burcham 1982:80).

Sacramento Valley Fauna

Among the most prominent mammals in the Sacramento Valley were three species of ungulate: tule elk, pronghorn, and black-tailed deer. Early historical accounts suggest that elk were common in all habitats on the valley floor (Schulz 1981). Although dubbed the "tule" elk, their association with the expansive marshes of the Central Valley is now thought to be a consequence of hunting pressure (Schulz 1981). Marshes may have served as a refuge from the commercial interests that quickly eliminated these animals from much of their former range during and after the gold rush. Based on observations of modern animals, it is likely that tule elk in the Sacramento Valley lived in small, fluid herds throughout much of the year. Residing primarily within the grassland prairie and oak woodlands, these animals would have moved in response to changes in local conditions and available forage (McCullough 1969). During the fall rut, elk aggregated into herds of perhaps as many as 30 females watched over by a single bull (McCullough 1969; White 2003a). Following the rut, females likely coalesced into larger herds, while the males would have broken off into smaller groups, averaging around six individuals. By mid-winter, larger female herds would have disbanded and smaller groups formed (McCullough 1969; White 2003a).

Like the tule elk, pronghorn were extirpated from throughout the Central Valley shortly after the gold rush (California Department of Fish and Game 1990:19; Popowski 1959:25). Historically, the valley is estimated to have had one of the largest populations of pronghorn in North America (Burcham 1982:96; California Department of Fish and Game 1990:19; Yoakum 1978:114). These animals would have been found throughout the prairie grasslands from the outer border of the riparian forests and marshes to the lower limits of the foothill woodland (Burcham 1982:96-97). Pronghorn rely on their great speed and excellent vision for defense, and avoid areas of high brush or dense trees. They are adapted to dryland habitats such as the valley margins, and often go for long periods without water, requiring just 3.8 to 5.7 liters (1.0-1.5 gallons) per day in the summer and much less (one liter, or approximately one quart) during months when succulent forbs are available (Van Wormer 1968:84; Yoakum 1978:100).

From March to October, does, fawns, and yearlings would have gathered into small herds of up to twenty animals, watched over by a dominant male. During the winter months, following the rut, pronghorn in the Sacramento Valley would have formed large herds up to several hundred animals. Although pronghorn are generally thought to be migratory, modern studies indicate that this is usually in response to weather conditions (usually snow). In areas like the Sacramento Valley where snow did not affect access to suitable forage, pronghorn probably did not migrate (Van Wormer 1968:142; Yoakum 1978:107). Modern studies have shown that during summer months pronghorn generally move between 0.1 and 0.8 kilometers (0.06 and 0.5 miles) per day, whereas during the fall and winter, daily movements can average between 3.2 and 9.7 kilometers (two and six miles) because of reduced forage (Yoakum 1978:108).

Unlike transitory elk and pronghorn, black-tailed deer in the Sacramento Valley were likely tied to a relatively small home range, covering no more than about 360 acres (Dassman and Taber 1956). These animals would have been most common in the riparian forests and oak woodland, but reached highest densities in the chaparral and woodlands of the surrounding foothills. Deer, unlike other ungulates of the Sacramento Valley, tend to be more solitary, residing individually or in groups of just a few animals (Dassman and Taber 1956).

Grizzly bear were once common throughout the Sacramento Valley, as were black bears. Puma, gray fox, bobcat, and coyote were the principal carnivores, along with badger, spotted skunk, and striped skunk, all of which could have been found in a variety of valley habitats. A host of other smaller mammals were common in the riparian and woodland communities including beaver, weasel, mink, and river otter, as well as raccoon, ringtail, grey squirrel, ground squirrel, woodrat, cottontail rabbit, and brush rabbit.

Marsh, grassland, and riparian habitats were home to resident waterfowl such as duck (*Aythya* spp.), coot (*Fulica americana*), cormorant (*Phalacrocorax auritus*), grebes (*Aechmophorus occidentalis*), herons (Ardeidae), cranes (*Grus* spp.), egrets (*Ardea* spp.), and gulls (*Larus* spp.). Between about November to February, enormous flocks of waterfowl migrating along the Pacific Flyway arrived in the Sacramento Valley. These included as many as 39 different species of ducks, geese (*Anser* spp. and *Chen* spp.), brants (*Branta* spp.), and swans (*Cygnus* spp.). Although much reduced from the historic period, modern single-season population counts of migratory waterfowl reach as many as 335,000 individuals (Shuford et al. 1998). In the spring, these species migrate as far north as Alaska and the Bering Straight to breed.

A diverse resident avifauna was also present historically in the Sacramento Valley, composed primarily of hawks, eagles, doves (Columbinae), quail, flicker, woodpeckers (Picidae), various other accipiters (Accipitridae), owls (Tytonidae and Strigidae), turkey vulture (*Cathartes aura*), and numerous passerine (i.e., perching) birds.

Open channels and lentic habitats of the river system and Delta each supported different types of fishes. In the open fast-moving waters of the rivers and larger streams were found resident hardhead, and sculpins. Sacramento sucker, and western pike-minnow were common in both fast- and slow-water habitats, while the calmer waters of the Delta and rivers were home to splittail (*Pogonichthys macrolepidotus*), hitch (*Lavinia exilicauda*), thicktail chub (*Gila crassicauda*), Sacramento blackfish (*Orthodon microlepidotus*), Sacramento perch (*Archoplites interruptus*), and tule perch.

While all five species of Pacific west coast salmon are known from the Sacramento Valley, Chinook salmon is the principal species (Herbold and Moyle 1989). Four large runs of Chinook occurred annually in the Sacramento-San Joaquin system, with fall and spring runs being the most significant (Herbold and Moyle 1989; Yoshiyama et al. 1996). It is estimated that each year, Native American fishers in the Central Valley harvested upwards of 8.5 million pounds of salmon (Yoshiyama et al. 1996). Other economically important anadramous fishes in the river system included white and green sturgeon (*Acipenser* spp.), Pacific lamprey (*Lampetra lethophaga*), and steelhead rainbow trout. Aquatic environments also supported pond turtle (*Clemmys marmorata*) and populations of freshwater mussel including, ridged mussel (*Gonidea angulata*) and *Margaratifera* spp.

CHAPTER 2: NATURAL AND CULTURAL HISTORY

The following chapter focuses on the paleoenvironment and prehistoric record of human occupation in the region now encompassed by Caltrans District 3. The paleoenvironmental synthesis describes proxy records derived from pollen, tree-rings, and other floral evidence, river flows, lake levels, sea-level rise, and geomorphologic changes. The discussions of prehistoric human occupation summarize archaeological evidence related to regional settlement patterns, technological developments, and subsistence change over the last 11,000 years or more. For purposes of discussion, we have divided the following section into four arbitrary time intervals (latest Pleistocene, early Holocene, middle Holocene, and late Holocene), which largely correspond to significant environmental and cultural transitions.

THE LATEST PLEISTOCENE (22,000-13,500 CAL BP)

Environment

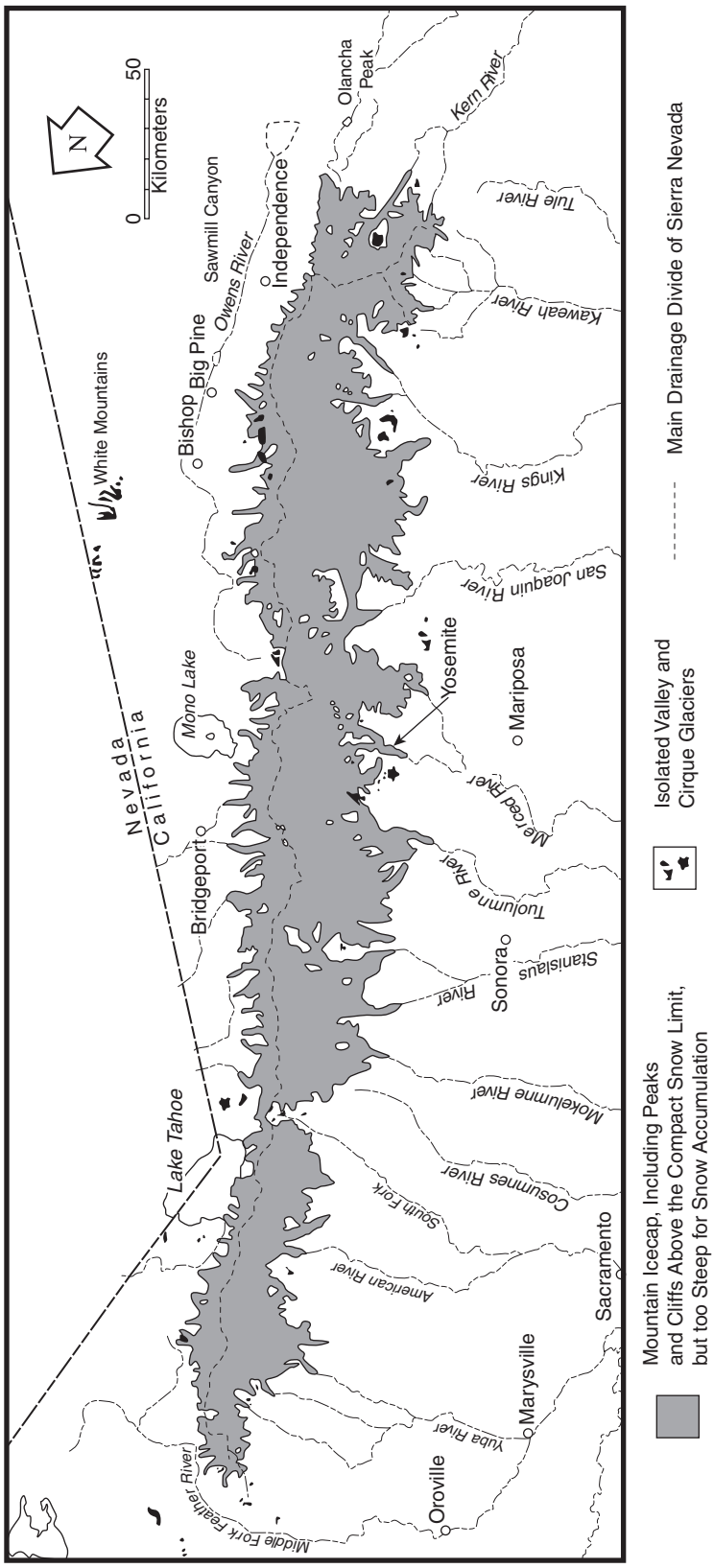
Climate in central California during the last glacial maximum, 22,000 years ago, was considerably cooler than at any time since. Known as the Wisconsin Glaciation, much of the world's fresh water was tied up in glacial ice. Two massive ice sheets formed over most of Canada and portions of the northern United States (Grayson 1993). To the east, the 3,355-meter-thick (11,000-foot) Laurentide Ice Sheet extended from Labrador to the eastern foothills of the Rocky Mountains. On the west, the Cordillerian Ice Sheet formed an almost 2,440-meter-thick (8,000-foot) cap that extended as far south as modern Seattle.

In the late Pleistocene, like today, as much as 40% of California's fresh water passed through the great Central Valley via the southward-flowing Sacramento and the northward-flowing San Joaquin rivers. These axial rivers were fed primarily from the east, by drainages with headwaters reaching the crest of the Sierra Nevada (Atwater 1980). The Sacramento and San Joaquin rivers merged near the central portion of the great valley and flowed westward. Termed the "California River" (Howard 1962), this massive drainage bisected the Coast Ranges through an opening at the Carquinez straights and flowed into the Franciscan Valley, a term applied by Axelrod (1981) to the trough now occupied by San Francisco Bay. Major streams draining the Franciscan Valley joined the California River just north of what is now Angel Island (Atwater et al. 1977) and flowed west through a bedrock notch at the Golden Gate and across the broad, flat plain of the continental shelf, ultimately reaching the Pacific Ocean near the modern-day Farallon Islands (Atwater et al. 1977; Axelrod 1981).

Glaciers

During the Wisconsin Glaciation, the crest of the Sierra Nevada was covered by an elongated sheet of ice averaging roughly 50 kilometers (32 miles) wide and extending from the headwaters of the Keaweah River on the south, to the Feather River on the north (Figure 17). The size of this glacier fluctuated many times through the late Pleistocene in response to variations in regional climate (Fullerton 1986). Fed by the main glacial cap, tongues of ice flowed down narrow valleys east and west of the Sierra crest and left moraines that preserve evidence of successive glacial advances and retreats. Study of these moraines has resulted in a general sequence of glacial and inter-glacial periods in the Sierra Nevada, dating to the late Pleistocene and Holocene (Curry 1969). The last major Pleistocene ice advance is known as the Tioga glaciation and was first defined from morainal deposits located on the eastern slopes of the Sierra Nevada (Blackwelder 1931; Curry 1969; Fullerton 1986). A radiocarbon date of 26,000 BP from glacial out-washes in the Kings River fan may provide a beginning date for the Tioga Glaciation (Atwater et al. 1986). The end of the Tioga advance is better constrained by several radiocarbon dates from glaciated basins in the Sierra dating less than 16,000 years cal BP (Table 1), consistent with worldwide evidence that glaciers began to recede about 17,400 cal BP (Schaefer et al. 2006).

A separate glaciation, the Hilgard, identified by a number of researchers as a late Pleistocene or Holocene event, has recently been refuted (Clark and Gillespie 1997). Type-moraines for the Hilgard advance are now thought to be recessional features associated with the Tioga glaciation (Birkeland et al. 1976; Clark and Gillespie



(Adapted from Wahrhaftig and Birman 1965)

Figure 17. Maximum Extent of Wisconsin Glaciation in the Sierra Neveda.

1997). Likewise, a recent re-evaluation of the smaller Recess Peak glaciation, previously identified as late Holocene in age, places this advance between 14,200 and 13,100 cal BP, during the latest Pleistocene (Clark and Gillespie 1997; Gillespie and Zehfuss 2004). Currently, the only Holocene glacial advance recognized in the Sierra Nevada is the relatively minor, Matthes glaciation during the Little Ice Age which began between 650 and 620 years ago and ended about AD 1900 (Curry 1969; Guyton 1998; Wahrhaftig and Birman 1965; Wood 1975).

Table 1. Radiocarbon Dates from Late Pleistocene Glacial Moraines in the Sierra Nevada.

Locality	Stratigraphic position	Material Dated	^{14}C BP	cal BP	Reference
Pine Creek					
outermost Tioga moraines	surface	rock varnish	19,050 ± 420	22,602	Dorn et al. (1987)
innermost Tioga moraines	surface	rock varnish	13,170 ± 200	15,780	-
Osgood Swamp					
in terminal Tioga moraine of Echo Lakes Glacier	above glacial flour	bulk sediment	9,900 ± 800	11,448	Adam (1967)
Swamp Lake					
near upper limit of Tioga ice, North Fork	in glacial flour	bulk sediment	15,565 ± 820	18,597	Batchelder (1980)
Stanislaus Valley	above glacial flour	bulk sediment	14,035 ± 510	-	-
Lake Moran					
in highest Tioga moraines, North Fork	above glacial flour	bulk sediment	12,180 ± 260	16,821	Byrne (1988)
Stanislaus Valley	in glacial flour	Mono Craters Ash	14,700-14,800	-	-
Swamp Lake – Yosemite					
covered by Tioga glaciation, Tuolumne Valley	above glacier flour	bulk sediment	13,690 ±340	16,419	Smith and Anderson (1992)
Siesta Lake					
in Tioga moraine	n/a	bulk sediment	11,280 ±60	13,274	Brunelle and Anderson (2003)
Tioga Pass Pond					
covered by Tioga glaciation, Sierra crest	above Mono Craters ash	bulk sediment	8760 ± 240	9,838	Anderson (1990)
Starkweather Pond					
in Tioga moraines	in sand and silts	bulk sediment	10,879 ± 150	12,929	Anderson (1990)
Laurel Creek Canyon					
in Tioga/Recess Peak moraine	n/a	carbonized leaves	13,600 ± 120	16,329	Pohl et al. (1996); Clark et al. (1995)
Barrett Lake					
area of Hilgard deposits	above glacial flour	bulk sediment	11,730 ± 430	13,817	Anderson (1987)
Upper Baboon Lakes					
in Recess Peak moraines	above glacial flour	bulk sediment	11,190 ± 70	13,161	Clark and Gillespie (1997)
Central Baboon Lakes					
in Recess Peak moraines	above glacial flour	Gyttja	10,880 ± 60	12,940	Clark and Gillespie (1997)
Gabbott Meadow Lake					
covered by Tioga glaciation	in sandy gravel	bulk sediment	10,500 ± 140	12,461	Mackey and Sullivan (1991)
Bunker Lake					
covered by Tioga glaciation	above glacial flour	charcoal?	11,180 ± 180	13,090	Edlund (1994a)
Grassy Lake					
covered by Tioga glaciation	above glacial flour	Bulk sediment	12.360 ± 100	13,380	Edlund (1994b)

Notes: Modified from Edlund 1991.

Floral and Pollen Records

Coast Ranges

Floral assemblages from throughout coastal central California indicate that late Pleistocene climate was more seasonal than today, with cooler temperatures, greater effective precipitation, and a longer rainy season (West 2000). Axelrod (1981) documents a near continuous distribution of coniferous forest extending from the northern California coast as far south as the Channel Islands and Los Angeles. Redwood (*Sequoia* spp.) and cypress (*Cupressus* spp.) wood dated between 40,000 and 25,000 BP are found in southern localities such as Carpenteria and at Rancho La Brea in Los Angeles. Douglas fir (*Pseudotsuga menziesii*) dated to 14,000 BP on Santa Cruz Island, and a nearly continuous distribution of Monterey Pine (*Pinus radiata*) and Bishop Pine (*Pinus muricata*) from Tomales Bay to San Miguel Island dated earlier than 26,000 BP, suggest an extension of coniferous forest some 240-320 kilometers (150-200 miles) south of its present boundary, and document the southern extent of a cooler, wetter climate (Axelrod 1981:849; Johnson 1977).

In the San Francisco Bay area, the Tomales Flora, dated at 29,000 BP, includes wood of Douglas fir, cypress, and Sitka spruce (*Picea sitchensis*) as well as a variety of shrubs and forbs (Johnson 1977). Johnson (1977:165) suggests that the occurrence of Sitka spruce and Monterey pine some 160 kilometers (99 miles) south and 120 kilometers (75 miles) north, respectively, of their modern distribution indicates a much more uniformly moist and cooler environment. A similar assemblage of cedar, cypress, pine, juniper, and fir macrofossils and pollen are found at Mountain View in clay deposits currently six to seven meters (19.7 to 23 feet) below sea level, dated between 23,000 and 20,000 years old. In the absence of redwood and oak, which are common in the region today, the Mountain View flora also imply a colder-wetter climate. As Axelrod (1981:850) points out, the nearest modern analog now occurs in the mountains some 175 kilometers (108 miles) to the north, where the mean annual temperature is 3-4 °C (5.4-7.2 °F) cooler than at Mountain View and winter snow-fall is common. The Douglas fir-dominated San Bruno Flora, dated around 10,000 BP, suggests that cooler-wetter conditions prevailed on the east-facing slopes of the San Francisco peninsula until the very end of the Pleistocene (Axelrod 1981; Potbury 1932). The closest modern analog occurs at Inverness Ridge, near Tomales Bay, where rainfall is currently 30 centimeters (12 inches) greater than at San Bruno (Johnson 1977; Potbury 1932).

Pollen spectra and macrofossils from the north Coast Ranges also show a more continental and cooler climate during the late Pleistocene. Peat deposits dated to 38,000 BP from the Santa Rosa plain contain pollen and preserved plant remains indicative of an upland pine-cedar forest with isolated fir trees (West et al. 2000). To the east, also indicative of a cooler and wetter climate (Adam 1988), late Pleistocene pollen spectra from the Clear Lake Basin show high frequencies of pine, fir, and Taxodium-Cupressaceae-Taxaceae (most likely cedar or cypress), in a region currently dominated by oak savanna and chaparral. Adam and West (1983) estimate that temperatures in the North Coast Ranges would have been between 2 and 4 °C (3.6 and 7.2 °F) cooler than today.

A pollen core recovered from the Laguna de Las Trancas in northern Santa Cruz County also reflects the dominance of conifer forest between 24,000 and 12,000 years ago (Adam et al. 1981). The presence of pollen from Grand fir (*Abies grandis*), Douglas fir, and pine in a region currently dominated by coastal sage (*Artemisia californica*) led Adam et al. (1981) to suggest that climate during the glacial maximum was 2-3 °C (3.6-5.4 °F) cooler and precipitation was about twenty percent greater than today. After 12,000 years ago, the Laguna de Las Trancas record reflects a substantial increase in redwood, grass, and Compositae pollen reflecting the on-set of warmer, dryer conditions associated with the Holocene. Adam et al. (1981:269) suggest that the significantly reduced frequencies of pine pollen after 12,000 years ago may indicate more severe summer droughts, restricting the distribution of pine to only the most favorable localities.

Sierra Nevada-Cascade Range

In contrast to the coastal record, pollen and macrofossil evidence from the western slope of the Sierra Nevada-Cascade Range indicate that the late Pleistocene in the interior may have been equally cold, but comparatively dry. Pollen profiles characteristic of the modern Great Basin are reported from woodrat middens in Kings Canyon (Cole 1983) and from cores collected at Tulare Lake in the San Joaquin Valley (Atwater et al. 1986; Davis 1999) and elsewhere across the western slope of the Sierra-Cascade Range (e.g., Adam 1967;

Anderson 1987; Davis and Moratto 1988; Starratt et al. 2002; West 2005). Six middens from Kings Canyon, five of which date between 20,000 and 12,500 BP, were collected from an elevational range of between 3,000 and 4,000 feet (920 and 1,270 meters) in modern oak-chaparral woodland. These samples contain high frequencies of pine and sagebrush pollen and macrofossils characteristic of a mixed forest of xerophytic conifers including western juniper (*Juniperus occidentalis var. occidentalis*), ponderosa pine, sugar pine, and single-leaf pinyon (*Pinus monophylla*). This assemblage is similar to that found today on the east side of the Sierra 1,640 to 3,280 feet (500 to 1,000 meters) higher in elevation. The occurrence of Sequoia pollen (*Sequoiadendron giganteum*), as well as macrofossils of incense cedar, California nutmeg (*Torreya californica*), and red fir in these same middens (an assemblages of species not found on the east side of the Sierra) also suggested to Cole (1983) that the climate was much colder during the late Pleistocene with a higher proportion of precipitation falling as snow. An absence of these latter mesophytic species in the youngest midden sample (ca. 12,000 BP), is consistent with a trend toward dryer and or warmer climate near the end of the Pleistocene at Kings Canyon.

Pollen profiles from Tulare Lake show a similar dominance of Great Basin-type vegetation during the late Pleistocene (Davis 1999). The Chatom Silt, dated between 26,000 and 13,000 BP, contains high frequencies of Cupressacae (probably *Juniperus*), sagebrush, and greasewood (*Sarcobatus vermiculatus*) consistent with comparatively dry conditions in the San Joaquin Valley. Accordingly, Tulare Lake appears to have been low during this interval, following a high stand between about 24,000 and 23,000 years ago (Davis 1999). Like the Kings Canyon record, redwood pollen is present in the Chatom silt, indicating that giant Sequoia was widespread during the full and late glacial period (Cole 1983; Davis 1999). The occurrence of Sequoia is consistent with Coles' (1983) contention that colder temperatures may have resulted in greater winter snow fall and increased summer run-off, allowing this mesophytic species to colonize the lowlands (Davis 1999). Davis (1999) speculates that the late Pleistocene upland vegetation in the foothills east of Tulare Lake consisted of pine-juniper woodland (probably including pinyon pine) with an understory of sagebrush. Greasewood probably grew on low salt flats bordering the lake (Davis 1999).

On the western slope of the Sierra-Cascade Range, a comparatively cold climate for the period, between 14,800 and 13,700 cal BP, is also indicated by lower surface water temperatures at Greenstone Lake (Porinchu et al. 2003) and Hidden Lake (Potito et al. 2006), reconstructed from Chironomid fossils (midge flies). At Swamp Lake in Yosemite, Smith and Anderson (1992) interpret January temperatures as about 3.7 °C (6.7 °F) cooler and temperatures in July about 3.0 °C (5.4 °F) cooler than at present. Late Pleistocene pollen records from lake and meadow sediments also include evidence of Great-Basin type flora, with elevated frequencies of sagebrush and greasewood and low frequencies of pine pollen. Greasewood, which does not occur on the western slope of the Sierra today, is found in late Pleistocene sediments west of the crest in the central and southern Sierra, at Gabbot Meadow (Mackey and Sullivan 1991), Exchequer Meadow (Davis and Moratto 1988), Nichols Meadow (Koehler and Anderson 1994), and Lake Moran (Edlund 1991). A cold-dry climate is further evidenced by the ubiquity and high frequencies of sagebrush and grasses and low frequencies of pine and cypress in virtually all late Wisconsin pollen records from the western Sierra (e.g., Davis and Moratto 1988; Edlund 1991, 1994a, 1994b; Koehler and Anderson 1994; Mackey and Sullivan 1991; Smith and Anderson 1992) and western Cascade (Starratt et al. 2002; West 2005). The proxy records from above 6,560 feet (2,000 meters) evince cold-adapted alpine vegetation dominated by sagebrush, grasses, and herbaceous species in areas now encompassed by montane forest, including Bunker Lake and Swamp Lake (Yosemite) in the central Sierra Nevada and at Medicine Lake in the southern Cascade Range (Edlund 1994a; Smith and Anderson 1992; Starratt et al. 2002). At a slightly lower elevation (ca. 6,000 feet [1,829 meters]) in the southern Cascades, West (2005) also reports very high concentrations of sagebrush pollen in sediments from Little Willow Lake dating between 15,900 and 14,100 cal BP.

Landscape Record

The late glacial period in central California is generally marked by extensive erosion of upland slopes and channels, and rapid deposition in lowland valleys. Stratigraphic and radiocarbon evidence indicate that glacial recession (deglaciation) was well under way by 17,000 years ago, and was essentially complete by 14,000 years ago (Anderson 1990; Anderson and Smith 1994; Clark and Gillespie 1997; Koehler and Anderson 1994; Pohl et al. 1996), before pluvial lakes east and west of the Sierra crest reached a late Pleistocene high stand (Anderson 1990; Atwater et al. 1986; Benson and Thompson 1987; Clark and Gillespie 1997). The regular occurrence of large

cobbles and boulders resting on bedrock at the base of alluvium-filled valleys in the western Sierra reveals that stream capacities and sediment-transport rates were much greater during the late Pleistocene than they are today (Koehler and Anderson 1994:13; Wood 1975:128). Similarly, the absence of older alluvial deposits suggests that the bottoms of these valleys were essentially "cleaned out" during the late Pleistocene (Wood 1975:115). This period of increased runoff and higher water flows continued until at least 13,665 cal BP, as indicated by a radiocarbon date from basal gravel and cobble layers (Haynes 1991; Unit A) in the Stanislaus River Canyon at Clarks Flat (CAL-342; Peak and Crew 1990).

The presence of extensive alluvial fans and floodplains on the floor of the Central Valley is evidence of the tremendous erosion and outwash of materials that occurred during the late Pleistocene (Arkley 1962; Atwater et al. 1986; Croft 1968; Davis and Hall 1959; Harden and Marchand 1980; Janda and Croft 1967; Marchand 1977; Marchand and Allwardt 1981; Weissmann et al. 2002). Geological studies in the Sierra foothills (Fresno County) and San Francisco Bay Area indicate that hillside hollows began to fill with colluvium during the late Pleistocene and early Holocene (Dietrich and Dorn 1984; Dietrich et al. 1986; Reneau et al. 1986, 1990; Rypins et al. 1989). Since the mobilization of debris-flows and colluvial landslides is generally associated with periods of intense rainfall (Rypins et al. 1989:84), the trend toward storage of colluvial material in these hollows may signal an overall lowering of storm intensity (Dietrich et al. 1986), allowing hill slopes to stabilize beginning in the late Pleistocene.

Pleistocene Fauna

Fossil remains of grazers and browsers that fed exclusively on grasses, forbs, and woody plants provide indirect evidence for substantial tracts of open woodland and grassland savanna in the lowlands of central California during the late Pleistocene (Edwards 1992). A survey of Rancho La Brea-age fossil sites from District 3 counties shows that a diverse group of large herbivores once roamed this region (Table 2). The ecology of these species is partly revealed in their distribution. Four extinct taxa are predominantly or exclusively found in foothill regions, including mastodon (*Mammut americanum*), shrub ox (*Euceratherium collinum*), Shasta ground sloth (*Nothrotheriops shastensis*) and Jefferson's ground sloth (*Megalonyx jeffersonii*). Mastodons were browsers thought to occupy open woodlands and are regularly found in the fossil record as single individuals, suggesting they lived a solitary existence (Edwards 1992; Grayson 1993). Remains of shrub ox are known from upland, hilly settings elsewhere in North America and are thought to have been grazers and browsers (Edwards 1992; Grayson 1993). Both species of ground sloth were browsers, foraging mainly on woody plants which appear to have been abundant in the foothills. These and other large herbivores roamed the western slope of the Sierra to elevations reaching as much as 7,280 feet (2,220 meters) based on an abundance of dung fungus (*Sporomiella*) in late Pleistocene sediments at Exchequer Meadow in the southern Sierra Nevada (Davis and Moratto 1988).

Carnivores are also relatively common in the foothill record including the extinct dire wolf (*Canis dirus*), thought to be primarily a scavenger (Marcus and Berger 1984), and sabertooth cat (*Smilodon floridanus*), as well as ancestors of the modern coyote (*Canis latrans*) and mountain lion (*Felis concolor*). Most of the Pleistocene fauna from the foothills come from limestone caverns including Hawver Cave and the Cool Quarry. The comparatively high number of bison bones in these contexts suggests they were scavenged nearby and returned to the caves by one or more resident carnivores (e.g., dire wolf, sabertooth cat, or mountain lion), the remains of which are also common in these assemblages. Further, the presence of horse and bison also suggests that open grasslands were relatively close to the limestone caverns during the late Pleistocene, whereas chaparral and grey pine-blue oak woodland currently dominate this portion of the foothills. The abundant sloth remains in these caverns probably indicate that they were periodic residents, as has been noted elsewhere in western North America (e.g., Harrington 1933).

In the Sacramento Valley, the remains of herding and grazing animals, such as horse (*Equus* spp.), mammoth (*Mammuthus* spp.), bison (*Bison* spp.), and camel (*Camelops hesternus*) are the most common, as are Harlan's ground sloth (*Paramylodon harlani*; e.g., Dundas and Cunnigham 1993; Hilton et al. 2000), also thought to be primarily a grazer. This array of large herbivores closely matches late Wisconsin fauna from the northern San Joaquin Valley and the Tulare Lake Basin (Fenenga 1991; Rosenthal and Meyer 2004b), providing strong evidence that much of the lowland Central Valley was covered in grasslands during the late Pleistocene. Mule deer, tule elk, and pronghorn are also found in late Pleistocene faunal assemblages from central California, representing the only large ungulates to have survived into the Holocene.

Table 2. Late Pleistocene Large Mammal Remains from District 3 Counties.

COMMON NAME	GENUS	SPECIES	FOOTHILLS NISP	VALLEY NISP	TOTAL NISP
GRAZERS					
Bison	*Bison*	*bison/latifrons*	10	33	43
Camel	*Camelops*	*hesternus*	-	6	6[a]
Horse	*Equus*	*major*	4	9	13
Harlan's Ground Sloth	*Paramylodon*	*harlani*	3	8	11
Columbian Mammoth	*Mammuthus*	*columbi*	-	7	7
Pronghorn	*Antilocapra*	*americana*	-	1	1
BROWSERS					
Shrub Ox	*Euceratherium*	*collinum*	3	-	3
Mastadon	*Mammut*	*americanum*	2	-	2
Shasta Ground Sloth	*Nothrotheriops*	*shastensis*	42	-	42
Jefferson's Ground Sloth	*Megalonyx*	*jeffersonii*	4	-	4
Mule Deer	*Odocoileus*	*hemionus*	17	-	17
CARNIVORES					
Dire Wolf	*Canis*	*dirus*	2	1	3
Coyote	*Canis*	*latrans*	2	2	4
Mountain Lion	*Felis*	*concolor*	47	-	47
Sabertooth Cat	*Smilodon*	*floridanus*	2	1	3
TOTAL			138	68	206

Notes: Data from Dundas and Cunnigham (1993); Hilton et al. (2000); Jefferson (1991); University of California Museum of Paleontology (2007); [a] Also includes camel remains from Oat Valley identified during the current study; NISP – Number of identified specimens.

THE PLEISTOCENE-HOLOCENE TRANSITION (13,500-11,500 CAL BP)

Environment

West (2000:19) points out that "the transition from the late Glacial Maximum (22,000 years ago) of the Pleistocene to the Holocene appears to have occurred in a step-like manner but with several reversals, the most significant being the period called the Younger Dryas." The Younger Dryas is a worldwide interval of colder climate that began abruptly around 12,900 years ago, lasting for approximately 1,100 years (12,900-11,800 cal BP). Evidence of this brief reversal in the general warming trend leading to the Holocene comes from marine sediments along the California coast (Kennett and Ingram 1995), fossil pollen records from Clear Lake (Adam 1988; West 2000, 2001, 2002), and from pluvial lake basins in eastern California and Western Nevada (Benson et al. 1997). Although not generally recognized in the Sierra, some paleoecological records reflect a brief period of cooler conditions around the time of the Younger Dryas. Midge fly remains from Greenstone Lake show a brief decline in surface water temperature between 12,000 and 11,500 cal BP, interrupting a sequential increase in temperature from the late glacial period through the early Holocene (Porinchu et al. 2003). Pollen profiles obtained from Lake Moran and Swamp Lake Yosemite show that both have elevated frequencies of mountain hemlock, interpreted as evidence for a cool-wet period between about 14,000 and 11,400 cal BP (Edlund 1991; Koehler and Anderson 1994; Smith and Anderson 1992).

Elsewhere in the Sierra-Cascade Range, primary shifts in vegetation occurred prior to the Younger Dryas, marking the transition from the late glacial climate of the Pleistocene to the post-glacial climate of the Holocene. For example, the peak in effective moisture at Lake Moran appears to have occurred just prior to the Younger Dryas (13,500 and 12,900 cal BP), when a dense lodgepole-western pine forest containing mountain hemlock and sugar pine quickly replaced sagebrush-dominated alpine vegetation. Similarly, at Nichols Meadow, a lower-montane forest and sequoia community replaced a woodland-steppe beginning about 14,500 cal BP and lasting

until about 10,000 cal BP (Koehler and Anderson 1994). At Willow Lake, in the southern Cascade Range, a rapid shift from sagebrush-dominated pollen to pine pollen also took place about 14,500 cal BP.

First Evidence of Human Occupation

By the time humans first entered central California, glaciers had receded from the Sierra crest, conifer forests were established at mid- to upper-elevations on the western slope, and the Sacramento Valley was a major river basin with extensive grasslands and riparian forest, providing forage for a diverse array of large vertebrates, many of which would shortly become extinct. The extensive central California Delta-Estuary had not yet developed and the Coast Ranges to the west formed a near continuous ribbon of conifer forest where woodland and chaparral communities now prevail.

The earliest tangible clue of human occupation in central California comes from isolated projectile points found in just a few locations. Most similar to Clovis points, these distinctive artifacts have been dated elsewhere in North America to a relatively brief interval at the end of the Pleistocene between about 13,500 and 11,500 cal BP (Fiedel 1999). A recent reconsideration of radiocarbon dates from Clovis sites has led Waters and Stafford (2007) to conclude that these projectile points may have been in use for a much shorter period—just 450 years—between 13,250 and 12,800 cal BP (Waters and Stafford 2007). They believe that the widespread distribution of Clovis points across much of North and South America is the result of technological diffusion, rather than a cultural migration. If so, Waters and Stafford (2007) suggest a pre-Clovis human population must have existed in North and South America; a contention that remains highly controversial, but more widely accepted by archaeologists than ever before.

The only Clovis-like fluted point reported from District 3 comes from Sierra County in the uplands (about 4,900 feet [1,494 meters] amsl) of the Sierra Nevada (Foster and Betts 1995; Rondeau 1998). Found near the town of Loyalton in Sierra Valley, this isolated specimen is made of non-local chert, probably carried to the site from either the western or eastern slope of the Sierra Nevada. Isolated fluted points have also been recovered in neighboring counties, including finds made near Thomes Creek in Tehama County (Dillon and Murphy 1994), at Big Meadows in Plumas County (Kowta 1988:Map 3), and on the dissected alluvial fans of southeastern Solano County (SOL-347), just north of the Delta (Jackson and Simons 1991). However, one of the most substantial collections of fluted points and other early tools in California comes from the Borax Lake site (LAK-36) located to the west of the current study area in Clear Lake basin (Harrington 1938, 1948). Meighan and Haynes (1970) have shown that fluted points from LAK-36 are contained in a Holocene-age debris-flow and are mixed with substantially younger archaeological materials. This has made interpretation of the Borax Lake assemblage difficult, despite strong evidence for Paleo-Indian occupation of the site (Meighan and Haynes 1970; Fredrickson and White1988).

In the absence of other parts of the Clovis tool kit, the recovery of isolated fluted points adds little to our understanding of the overall economy and lifeway of California's earliest documented inhabitants. We know from the context of these finds that a diverse array of habitats was exploited throughout California, from the coastal terrace (Simons et al. 1985) to the crest of the Sierra (Davis and Schutler 1969); however, the great majority of fluted points are found in lake basins, such as Borax Lake (Davis and Panlaqui 1978; Dillon 2002; Harrington 1948; Hopkins 1991; Rondeau et al. 2007). Most appear to have been surface or near-surface finds (but see La Jeunesse and Pryor 1996c), lacking other demonstrably associated artifacts and occupation debris. Consequently, these specimens are not well dated in central California. The only exception is seven hydration readings taken on fluted points recovered from the Borax Lake site (Meighan and Haynes 1970). These samples, all of Borax Lake obsidian, returned a mean value of 9.0 microns with a range of 8.0 to 9.5 microns (White 1999). Despite thousands of subsequent hydration readings on Borax Lake obsidian, these are the oldest values from any single projectile point type (White et al. 2002), clearly reflecting the primacy of fluted points in this region. However, extensive hydration sampling of obsidian debitage at the Borax Lake quarry indicates a very early use of this material, reflected by hydration bands up to 10.4 microns (Fredrickson and White 1988:88; Fredrickson and Origer 2002), alluding to the possibility of a pre-Clovis occupation in central California (White 1999; White et al. 2002).

Humans and Late Pleistocene Extinctions

By the close of the Pleistocene, 35 genera of mammals and 19 genera of birds had gone extinct in North America (Grayson 1993), including roughly half of the continent's large mammals (Alroy 2001). An impressive suite of radiocarbon dates is now available from extinct fauna recovered from Rancho La Brea in Los Angeles. These dates demonstrate that elements of the Rancho La Brea fauna persisted in California until about 12,900 cal BP, almost precisely the time of the Younger Dryas, and—if Waters and Stafford [2007] are correct—the end of the Clovis era. The largest number of dates was obtained from saber-tooth cat long bones (n=46), with the youngest accepted date being 13,195 cal BP (Table 3). The most recent accepted dates on horse, mastodon, and bison are 12,890, 17,250, and 14,638 cal BP, respectively (Table 3; Marcus and Berger 1984). The remains of ground sloth, mastodon, horse, and camel found at La Mirada in southern California are dated to as late as 12,575 cal BP, based on a radiocarbon date from wood stratigraphically associated with the faunal remains (Mead and Meltzer 1985). Lastly, a pygmy mammoth (*Mammuthus exilis*) recently discovered on Santa Rosa Island has been radiocarbon dated to 15,255 cal BP (Johnson et al. 2000). While these dates provide maximum age estimates for the extinction of California's mega-fauna, dietary bone assemblages from scattered archaeological sites throughout the west clearly indicate that these animals were gone from the landscape by about 10,500 cal BP (e.g., Beaton 1991; Erlandson et al. 1996; Fitzgerald 1997; Rick et al. 2001).

Table 3. Radiocarbon-Dated Late Pleistocene Fauna from California.

Common Name	Species	Youngest Date (cal BP)	Date Range (^{14}C BP)	Count	Material	Reference
La Brea						
Saber tooth cat	*Smilodon*	13,197	11,130->35,000	44	amino acids [a]	Marcus and Berger (1984)
Sloth	*Glossotherium*	-	19,480-27,890	3	amino acids [a]	Marcus and Berger (1984)
Horse	*Equus*	12,888	10,940->28,850	7	amino acids [a]	Marcus and Berger (1984)
Camel	*Camelops*	19,956	17,630-20,300	2	amino acids [a]	Marcus and Berger (1984)
Bison	*Bison antiquus*	14,638	12,275->32,850	5	amino acids [a]	Marcus and Berger (1984)
Mastodon	*Mammut*	17,250	14,350-14,430	2	amino acids [a]	Marcus and Berger (1984)
La Mirada						
Horse	*Equus*	12,577	10,690 ± 360	1	wood	Mead and Meltzer (1985)
Camel	*Camelops*	-	-	-	-	-
Mastodon	*Mammut*	-	-	-	-	-
Sloth	*Megalonyx*	-	-	-	-	-
Santa Rosa Island						
Pygmy Mammoth	*Mammuthus exilis*	15,255	12,840 ± 410	1	collagen	Johnson et al. (2000)

Notes: [a] Bone collagen dated as amino acids; dates on other bone fractions excluded (Marcus and Berger 1984; Mead and Meltzer 1985).

Because Clovis points have been found with mammoth, mastodon, and bison remains elsewhere in North America, it has commonly been assumed that these and other large vertebrates were regular prey for Clovis-age hunters (e.g., Aikens 1983; Martin 1967). This has further led to the hypothesis that humans had a direct or indirect role in the extinction of large vertebrates from North America at the end of the Pleistocene (Grayson 2001; Haynes 1991; Martin 1967). As Grayson (1993:72) has pointed out "it is hard not to be struck by the fact that, just as the large Pleistocene mammals were breathing their last, Clovis peoples were busy creating the sites marked by fluted points and mammoths." While the human overkill hypothesis has been well-promoted (Martin 1967, 1984; Martin and Steadman 1999), it remains controversial (e.g., Grayson 2001). Opponents of this hypothesis believe that the arrival of humans was likely coincidental and largely unrelated to a sequential demise of the mega-fauna already underway as a result of dramatic environmental reorganization at the close of the Pleistocene (Grayson 1993, 2001). Grayson (2001) points out that just six of the 35 genera of extinct species can be dated to the time of Clovis hunters and only mammoth, mastodon, and bison have been found in clear association with human tools, even though horse and camel are two of the three most common mammals in Pleistocene faunal assemblages (Grayson 1993). This suggests to Grayson (1993, 2001) that the extinctions were not synchronous,

but resulted from an extended process related to environmental change. Precisely when the extinctions occurred is an issue of continuing discussion, and has a direct bearing on the debate over the role of humans in the demise of the mega-fauna (Grayson 1993, 2001; Haynes 2007; Martin 1967, 1984; Martin and Steadman 1999).

It is relevant that, as yet, no unequivocal association between human tools and extinct fauna has been reported from California or the Great Basin (Grayson 1993). Given the uncertainty in timing of these extinctions, it seems reasonable to consider whether these fauna were even present in California when Clovis-age hunters first arrived in the region. Faunal dates from Rancho La Brea indicate that extinct species survived in California up to between 12,800 and 12,500 years ago. Younger dates are reported from La Brea and elsewhere in California, but none of these are widely accepted due to problems with dated samples (Marcus and Berger 1984; Mead and Meltzer 1984, 1985). Based on radiocarbon evidence from human remains at Arlington Springs, and from a handful of other cultural sites including Daisy Cave (Erlandson et al. 1996; Rick et al. 2001), Cross Creek (Fitzgerald 1997), Angeles Mesa (Taylor et al. 2001), and Tule Lake Shelter (Beaton 1991), it seems clear that humans had arrived in California by 13,500 to 11,000 years ago (Table 4). The convergence of radiocarbon dates appears to confirm the co-existence of humans and extinct mega-fauna in California during a brief period between about 13,500 and 12,500 cal BP (Figure 18). It remains to be proven, however, that the earliest Californians actually hunted the now-extinct fauna.

Table 4. Oldest Radiocarbon-Dated Human Remains and Cultural Deposits from California.

Locality	Context	Oldest Date (cal BP)	Date Range (^{14}C BP)	Count	Material	Reference
Tule Lake Shelter	Cultural Deposit	13,525	11,450 ± 340	1	charcoal	Beaton (1991)
Arlington Springs	*Homo sapiens*	13,040	10,960 ± 80	1	bone gelatin	Johnson et al. (2000)
		11,720	10,080 ± 810	1	collagen	Johnson et al. (2000)
Daisy Cave	Cultural Deposit	12,310	10,390-9180	2	charcoal	Rick et al. (2001)
		11,200 [a]	10,600 ± 70	1	*Tegula*	Rick et al. (2001)
		11,500 [a]	10,700 ± 90	1	*Haliotis*	Rick et al. (2001)
Angeles Mesa	*Homo sapiens*	12,275	10,500 ± 2000	1	collagen	Taylor et al. (2001)
Gabbot Meadow	Cultural Deposit	11,915	9750-9260	3	charcoal	Peak and Neuenschwander (1991)
Cross Creek	Cultural Deposit	10,300 [a]	9480-9900	9	*Saxidomus*	Fitzgerald (1997)
Skyrocket	Cultural Deposit	10,200	9240-8630	6	charcoal	La Jeunesse and Pryor (1996a)
La Brea Woman	*Homo sapiens* [b]	10,125	9000 ± 80	1	amino acids [b]	Marcus and Berger (1984)

Notes: [a] Marine reservoir corrected, 225 ± 35; [b] Bone collagen dated as amino acids.

A new theory adds an interesting twist to the debate over late Pleistocene extinctions and the role of natural versus cultural mechanisms. Recently, several researchers have suggested that a comet or meteorite impact is responsible for the Younger Dryas cooling, 12,900 years ago (Firestone et al. 2007a; Howard et al. 2007; J. Kennett et al. 2007; West et al. 2007). This event is thought to have triggered the abrupt extinction of North American mega-fauna and may have resulted in human behavioral shifts leading to the broad-spectrum economies of the post-Clovis Archaic Period (Firestone et al. 2007a, 2007b; D. Kennett et al. 2007). At least 26 localities across North America have produced elevated concentrations of "metallic microspherules and magnetic grains with elevated iridium, glass-like carbon, carbon microspherules, soot and charcoal in a carbon-rich black layer" (Becker et al. 2007). Researchers hypothesize that an impact or airburst may have occurred over the Laurentide ice sheet, resulting in formation of the Carolina Bays, "a group of about 500,000 crater-like, elliptical lakes, wetlands, and depressions" oriented toward the modern Great Lakes and Canada (Howard et al. 2007). It is thought that "the associated blast wave and thermal pulse would have contributed to the megafaunal extinctions and destabilized the Laurentide Ice Sheet, loading the atmosphere with dust, soot, nitrogen oxide, and water vapor and triggered the Younger Dryas cooling" (Firestone et al. 2007b). Although this emerging idea has not yet been widely vetted, there appears to be compelling regional evidence for an extra-terrestrial impact event, including at the site of Daisy Cave on Santa Rosa Island (Firestone et al. 2007a; West et al. 2007), evidence which may also be preserved in the latest Pleistocene landforms of central California.

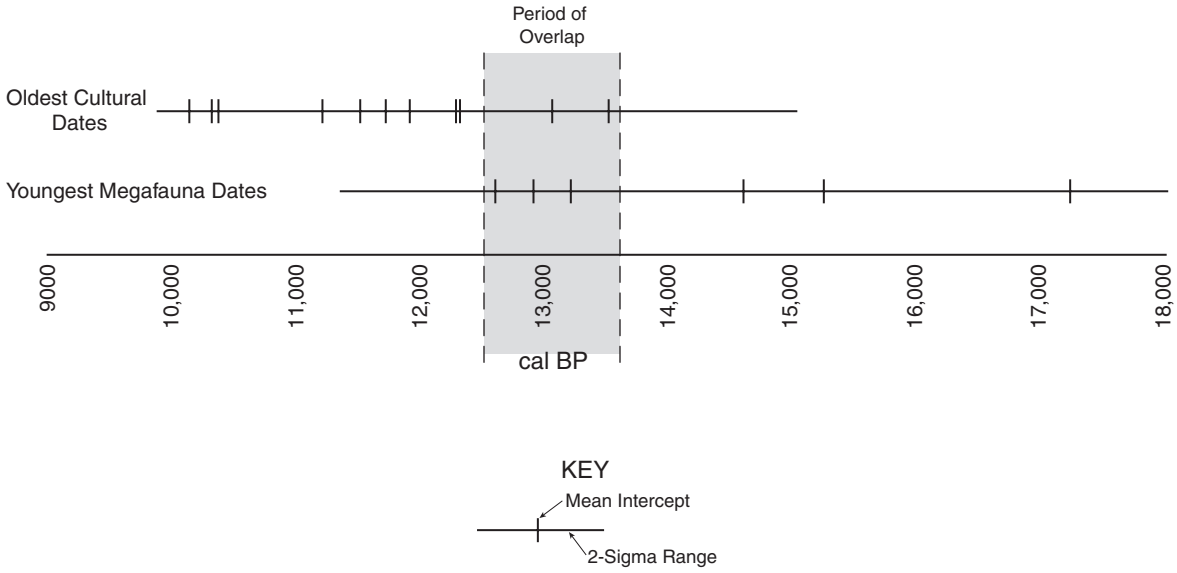


Figure 18. Chronological Relationship of Oldest Cultural Deposits and Youngest Extinct Megafauna.

EARLY HOLOCENE (11,500-7000 CAL BP)

Environment

As the continental ice sheets began to melt toward the end of the Pleistocene, oceans of the world rapidly rose, causing the Pacific shoreline to migrate eastward several kilometers. Between 15,000 and 11,000 years ago, sea levels rose about 55 meters (180 feet) at an average rate of about 13 meters (43 feet) every 1,000 years worldwide (Bard et al. 1996). Between 11,000 and 8000 BP, sea level rose by 25 meters (82.02 feet) causing ocean waters to move up the channel trenched by the California River, enter the Golden Gate, and spread across the exposed floodplain of the Franciscan Valley (Axelrod 1981; Helley et al. 1979). By 10,000 years ago, 50% of the area formerly covered by glacial ice was exposed (Bloom 1983) and sea-level rise was progressing at an average rate of about 8.3 meters (27.23 feet) every 1,000 years (Stewart et al. 2002). At the same time, numerous other canyons and valleys along the central California coast were flooded, forming bays and estuaries. As sea level rise slowed between 8,000 and 6,000 years ago (Atwater 1979; Atwater et al. 1977; Wells and Goman 1995), sedimentation began to outpace the rate of submergence, and tidal flats, marshes, and lagoons formed in the San Francisco Bay-Estuary and in many of the protected bays and inlets along the central coast, such as Elkhorn Slough, Morro Bay, Pismo Beach and at Bolinas Lagoon (Bickel 1978; Jones and Waugh 1997; Jones et al. 2002; Mikkelsen et al. 1998; West 1988, 2000).

Floral and Pollen Records

Coast Ranges

The transition to the Holocene after 11,800 years ago is reflected in a number of paleoenvironmental records marked by significant increases in temperature and decreases in precipitation (Adam and West 1983; West 2002). In the Clear Lake Basin, and elsewhere in the interior North Coast Ranges, the onset of the Holocene is marked by high oak and chaparral values, beginning about 9,500 years ago, reflecting an increase in drought-tolerant species (West 1993, 2001). Redwood appears to have responded rapidly to a changing environment along the coast, overtaking pine in the pollen profile at Laguna De Las Trancas, in Santa Cruz County, after 12,000 years ago (Adam et al. 1981). A core recovered near the mouth of the Russian River shows a similar florescence of redwood pollen at the beginning of the Holocene, reaching a maximum at around 6200 cal BP (Gardner et al. 1988; West 2000). An increase in coastal redwood peaking in the middle Holocene is likely a response to longer and warmer summers:

> As a result of greater oceanic-continental temperature contrasts, a stronger sea-to-land atmospheric gradient developed, which generated upwelling winds. Under these conditions of greater upwelling, the extent of maritime summer fog was probably greater in middle Holocene times than today. [West 2000:23]

As redwood is heavily dependant upon precipitation derived from fog drip, warmer interior temperatures would have been beneficial. In contrast, species such as Douglas fir, which are not as well adapted to summer drought, would have been restricted to more northern and upland localities.

Axelrod (1981) has shown that a number of plant species from arid and semi-arid regions to the south and east of San Francisco were able to colonize the valleys and uplands of the central Coast Ranges during the early to middle Holocene as a result of increased temperatures and more severe summer droughts. Likewise, many taxa favoring cooler and moister conditions retreated from the central Coast Ranges, leaving only isolated remnants in the most favorable microclimates. A number of semi-desert to desert plant taxa reached their northern extent in the Diablo Ranges near Mt. Diablo, and isolated stands of other south coast plant species in the uplands of Sonoma, Napa, and Solano counties, suggest a continuous distribution of xeric taxa from the central to southern North Coast Ranges during the early to middle Holocene (Axelrod 1981).

Central Valley and Sierra Nevada

At Tulare Lake, Kings County, the onset of the Holocene is marked by a return to high lake levels by about 10,300 cal BP and rapid deposition of the Blakely Canal silt (Davis 1999). A similar brief high-stand is also

recorded east of the Sierra at Pyramid Lake approximately 10,300 cal BP (Benson et al. 2002), interrupting a general drying trend during the early Holocene. The Tulare Lake pollen profile from 11,800 to about 9500 cal BP continues to reflect a Great Basin-type juniper and sagebrush woodland with greasewood growing on the lake-side salt flats (Davis 1999). After 9500 cal BP, peak values of oak, mountain mahogany (*Cercocarpus* spp.) and bitterbrush (*Purshia* spp.) indicate to Davis (1999) that the upland juniper-woodland was replaced by oak woodland and chaparral. A significant decrease in cypress pollen and the disappearance of redwood suggest that the transition to oak-woodland was associated with a drying trend, also indicated by a brief period of low lake levels at 9670 cal BP (Davis 1999). High frequencies of oak, mountain mahogany, and bitterbrush continue until about 7800 cal BP, and greasewood is present in low values until this time, after which it disappears from the Tulare Lake record (Davis 1999).

On the western slope of the Sierra, paleoenvironmental records consistently indicate a transition to warmer and dryer conditions during the early Holocene. This drying trend is not reflected in the North Coast Ranges which appears to have received greater precipitation during this interval (Anderson 1990; Davis and Moratto 1988; Davis et al. 1985; West 1993). By about 11,500 cal BP, subalpine conifers such as lodgepole pine (*Pinus contorta*), white pine, and limber pine (*Pinus flexilis*) became established at elevations up to 9,840 feet (3,000 meters) in the Sierra. High altitude forests were structurally different during the early Holocene than they are today, with montane chaparral shrubs and other open-ground species, indicating a more open forest (Anderson 1990). This is reflected in the pollen profiles from Siesta Lake, Yosemite, where pine and montane chaparral shrubs reach their highest post-glacial frequencies between 13,000 and 9750 cal BP, with abundant bush chinquapin (*Chrysolepis* spp.), Ericaceae (e.g., manzanita), sagebrush, Asteraceae (e.g., sunflower, mules ear), and grasses. These co-occur with high frequencies of Taxaceae-Cupressaccae-Taxodiaceae (probably juniper) and mountain hemlock, interpreted as evidence for dry and open conditions (Brunelle and Anderson 2003). After 9750 cal BP, the drying trend continues at Siesta Lake, with increasing pine and oak pollen frequencies and decreasing frequencies of fir and Taxaceae-Cupressaccae-Taxodiaceae (Brunelle and Anderson 2003).

Mid-elevations, such as Swamp Lake Yosemite, also witnessed significant changes in forest composition beginning around 11,500 cal BP, with the disappearance of subalpine and upper montane conifers (Smith and Anderson 1992), replaced by lower montane species. High frequencies of charcoal and oak pollen and low frequencies of fir at Swamp Lake are interpreted by Smith and Anderson (1992) as evidence for a warm-dry early Holocene. A more open forest/woodland is also indicated at Lake Moran, Tuolumne County, where ponderosa pine, Jeffrey pine, and incense cedar replaced white pine and lodgepole pine between about 11,500 and 8900 cal BP, and oak, bracken fern, mistletoe, and sagebrush pollen increased (Edlund 1991). Lower precipitation allowed a montane forest to invade Nichols Meadow, Madera County, between 9800 and 6800 cal BP. Oak pollen reached its highest frequencies at Exchequer Meadow, Fresno County, between 12,700 and about 7880 cal BP, along with high frequencies of sagebrush and pine pollen. Oak pollen also reached highest frequencies at Gabbot Meadow, Alpine County, during the early Holocene (Mackey and Sullivan 1991) and at several other lower-elevation (6,560 feet [2,000 meters]) meadows on the western slope, declining in abundance thereafter (Anderson and Smith 1994).

Sagebrush frequencies remained high from the late Pleistocene to the early Holocene in virtually all pollen records from the upper Sierra, leading most researchers to believe that the climate remained quite dry (Anderson 1990; Davis and Moratto 1988; Davis et al. 1985; Edlund 1991; Smith and Anderson 1992). This agrees with the findings of Borchardt and Lienkaemper (1999) who suggest that conditions in the east Bay Area during the early Holocene may have been dryer and perhaps warmer than today based on the development of calcium carbonate horizons in paleosols dated between 10,000 and 7000 cal BP. In the western Great Basin and Mojave Desert, the early Holocene was marked by a significant expansion of desert scrub communities in lowland basins and an increasing density of more-temperate conifers in the uplands by 9,000 years ago (Wigand and Rhode 2002). Additional evidence for a warmer early Holocene in the Sierra is provided by midge fly fossils from Greenstone Lake, which reflect surface water temperatures between 15.5 and 16.6 °C (60 and 62 °F), almost 2 °C (3.6 °F) warmer than temperatures recorded for the preceding Younger Dryas during the Pleistocene-Holocene transition (Porinchu et al. 2003).

Landscape Record

In the western Sierra Nevada, post-glacial warming at the end of the Pleistocene led to reduced runoff and fewer peak flood events, allowing for the deposition of fine sediments in stream channels and floodplains, which in turn permitted the growth of willow and sedge meadows and the formation of bogs in low-lying areas (Anderson and Smith 1994; Wood 1975:128). As the Holocene progressed, groundwater levels were reduced by the continued warming trend, allowing forests to invade the newly formed bogs and meadows. This expansion is evident at East Meadow in Yosemite where a lodgepole pine stump, dating to 10,720 cal BP, was rooted in a formerly active channel deposit (Wood 1975:49, 52). At this same location, additional stumps were found in a buried soil developed on weathered bedrock, dated to 10,195 cal BP. A similar process of soil formation and meadow invasion by forest during the early Holocene is indicated at Nichols Meadow, where buried Giant Sequoia logs are dated to 11,300 cal BP (Koehler and Anderson 1994).

Throughout the western slope of the Sierra, buried soils dating to the early Holocene have been identified in alluvial and colluvial fans, and within alluvium-filled meadows and floodplains (Stewart et al. 2002:12). A growing body of radiocarbon and stratigraphic evidence from throughout central California indicates that many early Holocene land surfaces were buried by a rapid period of deposition around 7000 cal BP (Meyer 1996; Meyer and Rosenthal 1997; Rosenthal and Meyer 2004a).

The Tsoyowata and Mazama Tephras

In many places throughout the northwestern United States and southwestern Canada, the stratigraphic transition from the early to middle Holocene is marked by two related tephras (i.e., unconsolidated strata of volcanic ash) originating from the current site of Crater Lake, Oregon. The Tsoyowata ash-fall and related Lloa Rock pumice, dated at about 7800 cal BP, are ejecta from the first of two significant eruptions that spread volcanic debris across an area about 1.7 million square-kilometers (Sarna-Wojcicki et al. 1983). The subsequent Mazama ash bed is the most widespread tephra in western North America and was deposited shortly after the Tsoyowata, between about 7570 and 7685 cal BP (Sarna-Wojcicki et al. 1991).

The Tsoyowata and Mazama ash beds have been identified in numerous lake basins and other alluvial deposits throughout northeastern California and the northwestern Sierra Nevada-Cascade Range, extending as far south as Yosemite and Mono Lake (Table 5; Figure 19). In many locations, the Tsoyowata tephra closely underlies the Mazama ash, but at most sites in the western Sierra, only the earlier Tsoyowata tephra is present. This earlier ash-fall appears to have covered a much larger area south and west in the Sierra Nevada than the Mazama ash, which is limited to the southern Cascade Range and western Great Basin (Figure 19).

Table 5. Identified Deposits of Tsoyowata and Mazama Tepha in Northeastern California.

Location	Ash fall	Depth (cm)	Thickness of tephra (cm)	Associated ^{14}C Date(s) (cal BP)	Reference
Tulelake	Tsoyowata	177/228	8	n/a	Rieck et al. (1992)
Medicine Lake	Tsoyowata	152	2.5	>7710	Starratt et al. (202)
	Mazama	148	2.5	>6900, <7710	Starratt et al. (2002)
Secret Creek	Mazama	n/a	reworked	n/a	McGuire (1997)
Grassy Lake	Tsoyowata	170-178	8	n/a	Edlund (1994b)
Osgood Swap	Tsoyowata	170	±3	<7840	Adam (1967)
Bunker Lake	Tsoyowata	286-302	16	<	Edlund (1994a)
Gabbott Meadow Lake	Tsoyowata	196	discontinuous	<8375	Peak and Neuenschwander (1991)
Hidden Lake	Tsoyowata	347-351	n/a	<9611	Potito et al. (2006)
Lake Moran	Tsoyowata	229-232	3	<7735	Edlund (1991); Mensing and Southon (1999)
Lake Aloha	Mazama	20-22	2	>7605	Clark and Gillespie (1997)
	Tsoyowata	25-50	25	<7960, <7965	Clark and Gillespie (1997)
Swamp Lake	Tsoyowata	429	n/a	n/a	Smith and Anderson (1992)
Mono Lake	Tsoyowata	n/a	n/a	n/a	Sarna-Wojcicki et al. (1991)
	Mazama	n/a	n/a	n/a	Sarna-Wojcicki et al. (1991)

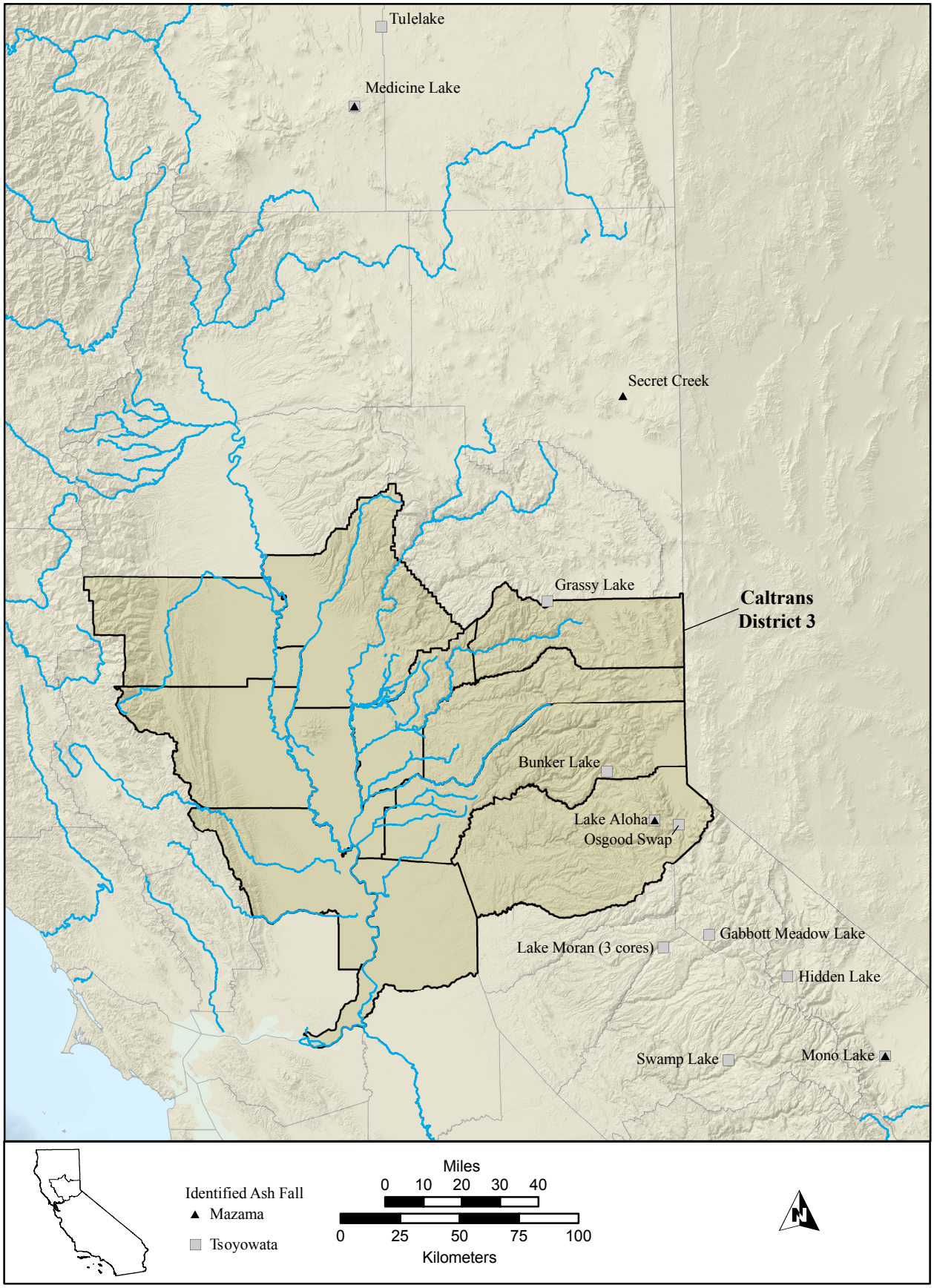


Figure 19. Evidence of Mazama and Tsoyowata Ash Falls in the Sierra Nevada-Cascade Range.

Human Occupation

Archaeological deposits found throughout central California reveal that a diverse range of habitats was used by early human foragers from high elevations of the Sierra to the Pacific coast. In the current study area, there is now abundant evidence that the Tahoe Basin was regularly occupied during the early Holocene. One of the best assemblages comes from the Visitors Center site (Forest Service #05-19-795), on the south shore of Lake Tahoe (Figure 20). This deposit produced Great Basin Stemmed points and thick Bodie Hills hydration readings averaging 7.0 microns, alluding to occupation of the site more than 7,000 to 8,000 years ago (Martin 1998). In addition, as many as 64 Great Basin Stemmed points have now been recognized from a variety of sites in the Tahoe-Truckee region (Figure 21; Duke and Smith 2006; McGuire et al. 2006). Just south of Tahoe, Peak and Neuenschwander (1991) reported three >10,000 year-old radiocarbon dates from a buried hearth and occupation surface at ALP-192 in Gabbott Meadow (6,500 feet [1,980 meters] amsl). Other sites in Gabbott meadow produced several early Holocene Great Basin Stemmed points and suggestively large obsidian hydration rim values. North of the current study area, Neuenschwander (1994) reported wide-stem points and a 10,000+ year old date from a basal stratum at PLU-88 (6,300 feet [1,920 meters] amsl), providing additional evidence for seasonal use of high-elevation localities during the early Holocene. In the foothills of the western Sierra, just south of the current study area, deeply buried and stratified deposits of this age are known at Clarks Flat (CAL-342) and the Skyrocket site (CAL-629/630). However, the only evidence for early Holocene use of the Sierra foothills in Caltrans District 3 comes from a handful of large hydration readings from sites in Butte, Placer, and Sacramento counties (Baker 2000a, 2000b; Delacorte and Basgall 2006; Jackson 1996; Peak 1981), but well defined-tool assemblages are lacking in these localities.

No early Holocene sites have previously been identified in the Sacramento Valley proper (but see Chapter 5), yet several have been recognized in the Coast Ranges, in and adjacent to District 3. For example, two deeply buried and stratified early Holocene deposits (CCO-696 and -637) were identified at the Los Vaqueros Reservoir locality in the northern Diablo Range (Meyer and Rosenthal 1997, 1998). These sites included diverse tool assemblages, human graves, and floral and faunal remains. To the west of the current study area, in Clear Lake Basin, several sites in and around Anderson Flat have produced Borax Lake Wide-stem points and other early Holocene tools (Fredrickson and White 1988; White et al. 2002). Early Holocene obsidian hydration readings (mean = 7.9 microns Borax Lake) are reported from LAK-1581 located along Cache Creek (DeGeorgey 2004), and a rock-lined hearth at LAK-1682 was dated to 8145 cal BP in Coyote Valley on the head waters of Putah Creek (Rosenthal et al. 1995). Both of these sites occur on eastward flowing drainages that pass through District 3. In addition, within the current study area, Borax Lake Wide-stem Points and large Borax Lake obsidian hydration readings are reported from two sites (COL-76 and -81) at Fouts Springs in Colusa County (Slaymaker 1983).

At higher elevations within the conifer forest of the North Coast Range, Borax Lake points and other early tools forms (e.g., formed flake tools) are known from ridge-top hunting sites and more substantial encampments (e.g., Hildebrandt and Hayes 1993). While these high-elevation sites were once thought to be middle Holocene in age (e.g., Hildebrandt and Hayes 1983 1993), a house floor from HUM-573 was recently dated to 7945 cal BP, placing it within the early Holocene. Likewise, the Squaw Creek site (SHA-475) in Shasta County produced Borax Lake Wide-stem points and other tools in a stratum radiocarbon dated to between 8350 and 7450 cal BP (Clewett and Sundahl 1983; Sundahl and Henn 1993), providing additional evidence that Wide-stem assemblages in the North Coast Ranges are likely no younger than their more southern counterparts in the Clear Lake Basin (c.f., White et al. 2002).

The distribution of known early Holocene sites reveals widespread use of the foothill woodlands surrounding the Central Valley, as well as regular occupation of the confer forest zone of the Sierra and Coast Ranges. Handstones, millingslabs, and a variety of other cobble-based pounding, chopping, and scraping tools are the most commonly reported artifact classes from early Holocene sites in northern California (Hildebrandt and Hayes 1983 1993; La Jeunesse and Pryor 1996d; Meyer and Rosenthal 1997; Peak and Crew 1990; Rosenthal et al. 1995; White et al. 2002), revealing a clear reliance on plant foods.

Often with diverse toolstone assemblages, early Holocene sites in the Sierra and Coast ranges appear to represent frequently re-used encampments, part of a seasonally mobile settlement system (Basgall and True 1985; McGuire and Hildebrandt 1994; Moratto 2002; Rosenthal 2006; White et al. 2002:523). Nut crops associated

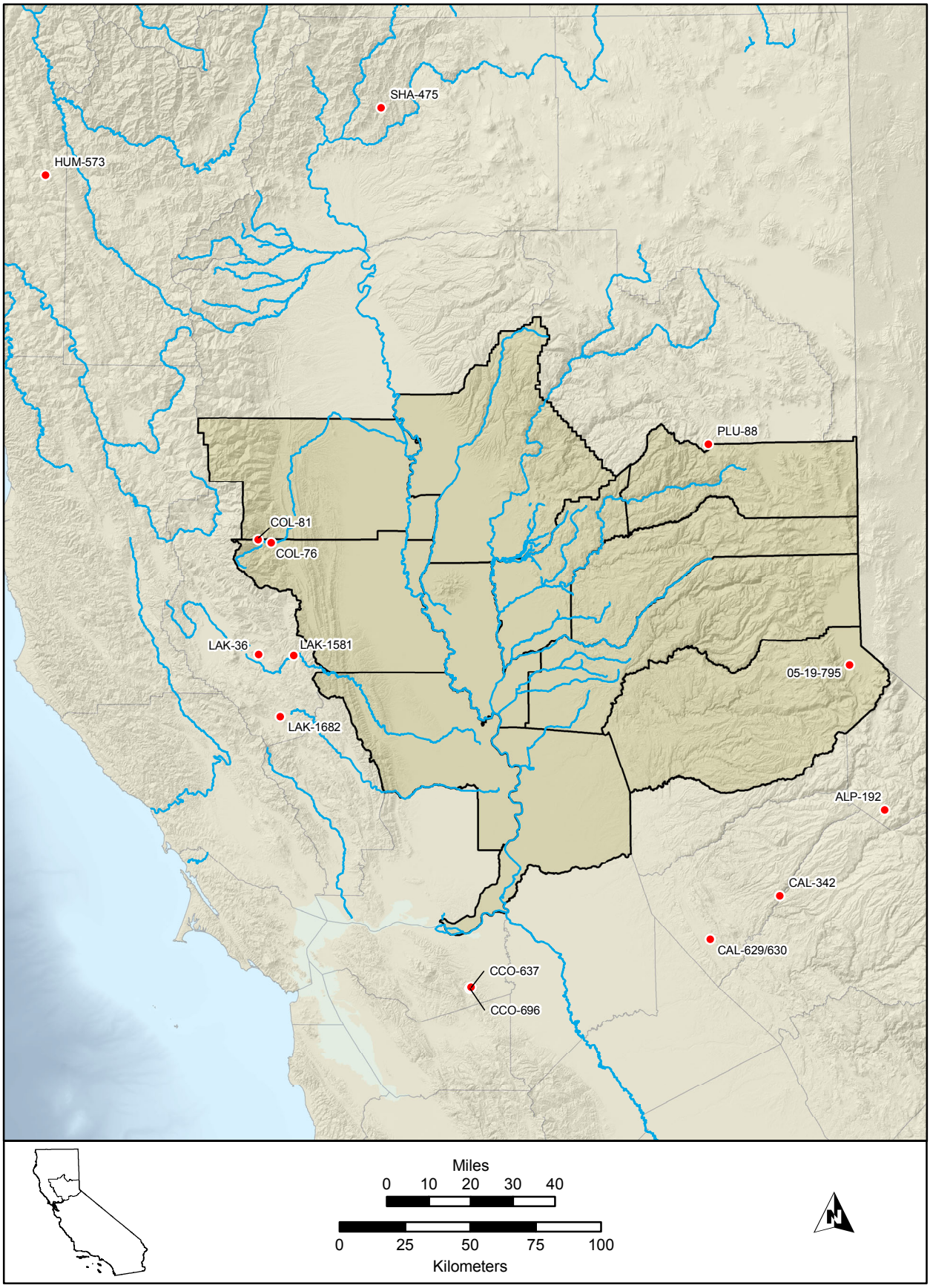


Figure 20. Early Holocene Sites in Central California.

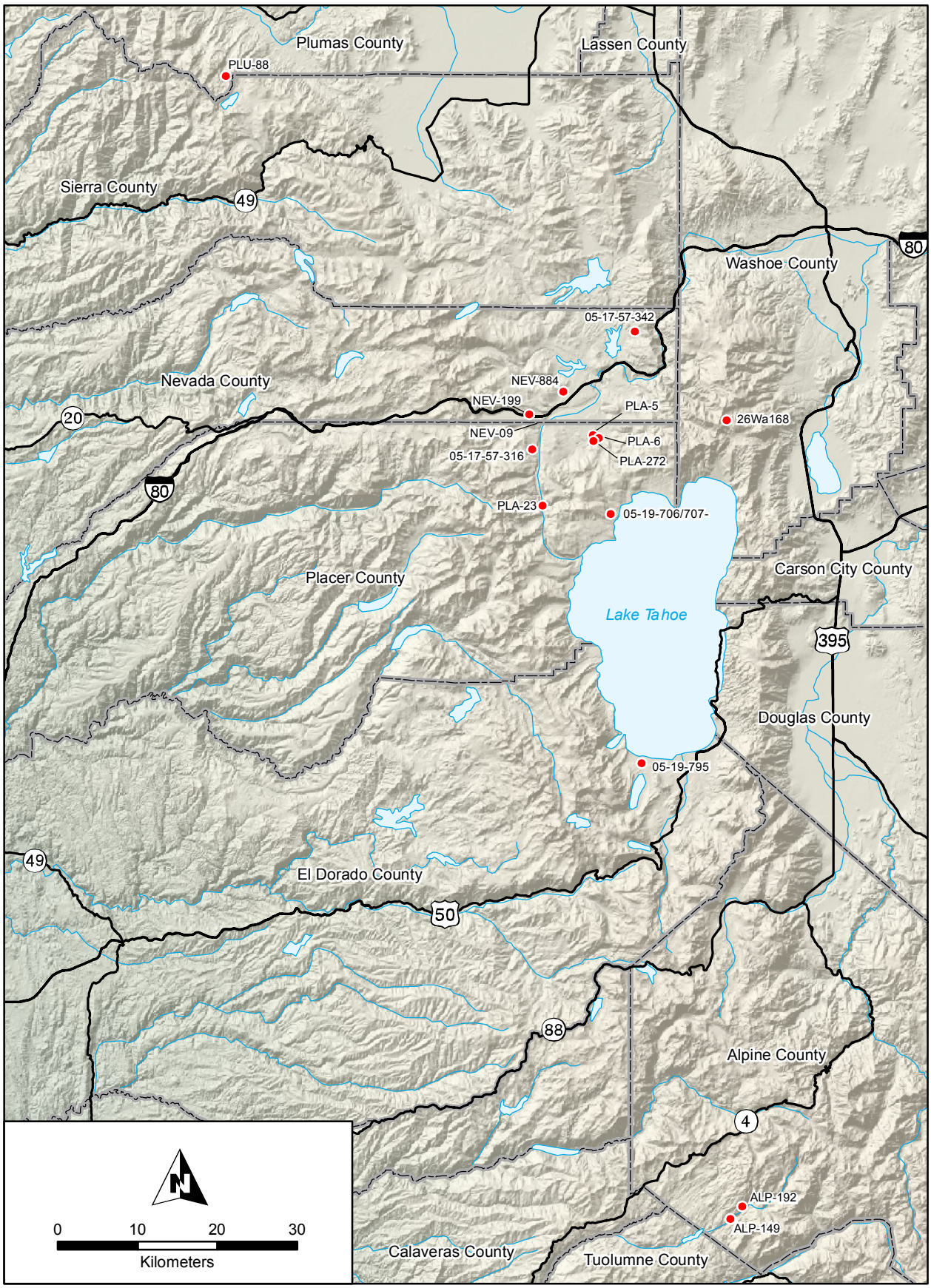


Figure 21. Locations of Great Basin Stemmed Points in the Truckee-Tahoe Area.

with expanding woodlands appear to have been a primary focus of seasonal plant exploitation, more so than small seeds which are commonly portrayed at the dominant resource (c.f., Basgall 1987; Fredrickson 1974; Kowta 1988; McGuire and Hildebrandt 1994). The charred remains of acorn nutshell from CCO-696 at Los Vaqueros and acorn and gray pine nutshell from the Skyrocket site (CAL-629/630) and sites in Clear Lake Basin, provide direct evidence for use of these nut crops during the early Holocene (Meyer and Rosenthal 1997; Rosenthal and McGuire 2004; White et al. 2002:527). The near absence of small seeds in archaeo-botanical assemblages from the foothills may simply reflect site use during late fall, when small seeds are unavailable. If nut crops were indeed an important part of the early Holocene economy, it is probably significant that pine and oak pollen increased substantially in upper elevation localities in the Sierra and Coast Ranges during this time period (Anderson and Smith 1994; Davis and Moratto 1988; West 1993), alluding to greater foraging opportunities (e.g., Hildebrandt and Hayes 1983 1993).

Although bone of any kind is rare in early Holocene sites from central California, early deposits often contain large broad-stemmed projectile or spear points. These points tend to be moderately to heavily re-worked with flat to indented bases and broad-stems, including Borax Lake Wide-stem points from the North Coast Ranges (Slaymaker 1983; Rosenthal et al. 1995; White et al. 2002). Numerous other examples from the Sierra Nevada more resemble Lake Mojave and Silver Lake points, characteristic of early Holocene assemblages found in the Great Basin (La Jeunesse and Pryor 1996c; Meyer and Rosenthal 1997; Peak and Crew 1990). This may not be surprising, as we know the crest of the Sierra was regularly crossed during the early Holocene by people who presumably lived both east and west of this imposing topographic divide. Shell beads from coastal California are found in early Holocene deposits in the western and central Great Basin (Fitzgerald et al. 2005; Bennyhoff and Hughes 1987), and obsidian from eastern Sierra quarries makes up a large portion of the non-local flaked stone tools and tool-making debris found in early Holocene sites in central California, such as Clarks Flat, Skyrocket, and Los Vaqueros.

Another striking characteristic of early Holocene assemblages in the Sierra foothills is the regular occurrence of large, well-thinned bifaces and other tools made of a distinctive greenstone (meta-volcanic or meta-sedimentary stone). Although also found in tool kits from later time periods, use of greenstone was common during the early Holocene in the Sierra, as this material is well represented at Skyrocket and Clarks Flat. A buried greenstone quarry at Rancho Murieta, located within the current study area, was reported by Peak (1981). A single Borax Lake obsidian flake provides the only indication of the age of this quarry, returning an early Holocene or late Pleistocene reading of 11.0 microns. Basalt quarries in the Tahoe-Truckee region (Bloomer et al. 1997; McGuire et al. 2006) and the Borax Lake obsidian quarry in the southern North Coast Ranges (Fredrickson and Origer 2002; White et al. 2002) have also produced projectile points and hydration evidence indicating regular use of these toolstone sources during the early Holocene.

MIDDLE HOLOCENE (7000-4000 CAL BP)

Environment

It was not until about 6,200 years ago that salt waters of San Francisco Bay reached Browns Island at the mouth of what is now the Sacramento-San Joaquin Delta, and formed the brackish-tidal marsh found at the site today (Goman and Wells 2000; contra Shlemon and Begg 1975). Between 6200 and 5550 cal BP, an incipient tidal marsh formed and drowned frequently at Browns Island interpreted by Goman and Wells (2000) as evidence for a non-linear rate of sea-level rise. After 5500 cal BP, inundation was less frequent and the brackish-water marsh matured, likely in concert with the maturation of the larger Delta-Estuary. This feature dominated the central California landscape from that time on, ultimately encompassing some 494,000 acres in a roughly triangular-shaped zone that expands eastward from a constriction point at the Coast Ranges (Atwater 1980; West 1977). Basal peat deposits from 15.2 meters (49.8 feet) below Sherman Island, located just east of Browns Island, have been dated to 7700 cal BP, indicating that a freshwater marsh was established in the western Delta region prior to inundation by rising ocean waters (cf. Goman and Wells 2000; Shlemon and Begg 1975; West 1977). The extent of an earlier freshwater marsh remains unclear, but appears to have been confined to a narrow strip immediately surrounding the confluence of the Sacramento and San Joaquin rivers (Shlemon and Begg 1975:Figure 5). Marshlands may not have extended to the eastern and southern Delta until the late Holocene, reaching a maximum extent perhaps only within the last 1,000 years (see Figure 8; Atwater 1980; Shlemon and Begg 1975).

Floral and Pollen Records

Coast Ranges

A number of studies from the Coast Ranges suggest peak Holocene warming likely occurred prior to 5000 cal BP. Oak and chaparral pollen reached highest frequencies in the North Coast Ranges and Santa Barbara region at this time, along with peak amounts of redwood pollen in more maritime settings (e.g., Adam 1988; Adam and West 1983; Adam et al. 1981; Heusser 1978; Jones and Waugh 1997; West 1993). Axelrod (1981) estimates that July temperatures during the middle Holocene in central California were about 1 °C (1.8 °F) warmer than today, corresponding to the 1.4 °C (2.5 °F) increase suggested by Adam and West (1983; West 1993). In the Clear Lake Basin, chaparral pollen values began to increase as early as 7800 cal BP, with time transgressive expansion at higher elevations to the north and east of the basin (West 1993). Similarly oak pollen values, which began an upward trend in the early Holocene, reached their highest frequencies in the Clear Lake Basin around 5700 cal BP. This shift is evident at higher elevations as well, where oak reached peak Holocene frequencies about this time (West 2002). Parallel shifts in the abundance of chaparral species are also noted, with buckthorn moving into existing chaparral communities and tan oak/chinquapin expanding its range (West 2002). In concert with these changes in vegetation, Clear Lake shrank to a narrow band between 8865 and 3775 cal BP (White et al. 2002), matching similar declines in other western lakes (see *Lake Levels and Stream Flows* on page 57).

San Joaquin Valley and Sierra Nevada-Cascade Range

Of the paleoenvironmental records from the San Joaquin Valley and Sierra Nevada, those of the middle Holocene are the most variable, complex, and contradictory, especially between different regions. The middle Holocene (i.e., "Altithermal") has long been characterized as distinctly warmer and drier than today, based on studies from the Great Basin and Desert Southwest (Antevs 1955; Baumhoff and Heizer 1965). While some Sierran records support this view (e.g., dendrochronologic, paleohydrologic), much of the pollen and macrofossil evidence indicates that conditions were cooler and wetter between about 7000 and 4000 cal BP (Anderson 1990; Anderson and Smith 1994; Davis et al. 1985; Davis et al. 1976; Davis and Moratto 1988; Koehler and Anderson 1994; Wood 1975; Woolfenden 1996). The apparent inconsistency of these records has led to a lack of consensus among researchers attempting to interpret the nature, extent, and magnitude of middle Holocene paleoenvironmental change in the Sierra.

In the San Joaquin Valley, the early to middle Holocene transition is marked by a brief low stand at Tulare Lake between about 7700 and 7500 cal BP, heralding the start of a significant warm-dry interval in that region. Frequencies of pelagic algae decline in the pollen record, as did frequencies of oak, mountain mahogany, bitterbush, and greasewood, while peak amounts of other Compositae and deteriorated pollen are recorded for this time interval. After 7500 cal BP, steadily declining stream inflow is indicated by higher frequencies of littoral palynomorphs and declining pollen concentrations; low pelagic algae frequencies evince generally low lake levels until the lake began drying up beginning approximately 4500 cal BP.

Warm-dry conditions of the mid-Holocene in the Coast Ranges and San Joaquin Valley are not consistently reflected in the paleoenvironmental proxy data from the Sierra. Most pollen and macrofossil records from this region seem to provide evidence for cooler temperatures, increasing soil moisture, or greater seasonal precipitation. This would indicate that the early Holocene xerothermic in the Sierra was over by about 7,000 years ago. Changing conditions are evident at Balsam Meadow (Fresno County) where the surrounding open woodland was replaced by closed-canopy pine forest beginning as early as 7800 cal BP (Davis et al. 1985). A similar transition to closed-canopy pine forest is recorded near Exchequer Meadow (Fresno County) at about this same time. Greater soil moisture appears to have been responsible for the expansion of fir near several high- and low-elevation meadows beginning around 6800 cal BP, and by mountain hemlock surrounding high elevation meadows between 6800 and 6300 cal BP (Anderson and Smith 1994). Significant up-swings in fir and mountain hemlock pollen are also recorded at Siesta Lake between 6400 and 3000 cal BP, and other high-elevation localities including Starkweather Pond (Madera County) and Barrett Lake (Mono County), beginning about 6800 cal BP (Anderson 1990). At high-elevation Tioga Pass Pond in Yosemite, a dry and open shrub-dominated meadow was colonized by lodgepole pine at about this time (Anderson 1990). Lower percentages of montane chaparral shrubs and other open-ground species at Starkweather Pond and Barrett Lake are interpreted by Anderson (1990:485) as

evidence for "greater closure of Sierra forests in general." On the other hand, too much soil moisture appears to have precluded forest development at Nichols Meadow, where wet conditions developed beginning approximately 6800 cal BP, lasting up to the present (Koehler and Anderson 1994). Early Holocene aridity appears to have continued longer at Lake Moran to the north where the re-establishment of a pine-fir forest did not occur until about 5800 cal BP (Edlund 1991).

At lower elevations on the western slope, gray pine-blue oak woodland was established in the foothills of the central Sierra by the middle Holocene. Radiocarbon-dated nutshell from several archaeological sites located in the watersheds of the Tuolumne and Stanislaus rivers, provide direct evidence for the presence of endemic gray pine by 7,000 years ago at elevations between 1,400 and 2,500 feet amsl (450 to 760 meters; Figure 22). That a comparatively dry—essentially modern—environment was likely present in the lower foothills by 10,000 years ago is further indicated by the recovery of gray pine and acorn nutshell from early Holocene strata at the Skyrocket site (CAL-629/630; see ahead to Table 6). Identification of these same species in middle Holocene features and stratigraphic contexts at sites in the northern Diablo Range indicates that gray pine-blue oak woodland was also established on the western side of the Central Valley by at least 5000 cal BP (see ahead to Table 6).

Lake Levels and Stream Flows

The middle Holocene hydrological record from upper elevations of the Sierra Nevada contrasts somewhat with interpretations of the pollen and plant macrofossil evidence. The hydrological record seems more in line with the arid conditions thought to prevail east of the Sierra at about this time. Evidence from the Lake Tahoe-Pyramid Lake system indicates low lake levels and comparatively dry conditions between about 7200 and 3100 cal BP (Benson et al. 2002), although fluctuations in lake levels are evident. At Pyramid Lake, at least one significant high stand appears to have occurred between 7000 and 6800 cal BP. By 6500 cal BP, trees became established ten to 15 feet below the outflow sill of Lake Tahoe, consistent with a significant reduction of inflow marking an extended period of reduced water levels (Benson et al. 2002). Between 6,500 and 3,800 years ago Lake Tahoe ceased overflowing into the Truckee River and Pyramid Lake levels declined (Benson et al. 2002; Lindström 1990). At this same time, Sierra runoff through the Owens Valley was significantly reduced and Owens Lake desiccated (Benson et al. 2002). Similarly, between 7200 and 3800 cal BP upper tree lines in the Sierra Nevada were some 68 meters (223 feet) higher than today, suggestive of significantly warmer temperatures (Scuderi 1987). In accord with the Coast Range record, pervasive drought during the middle Holocene is reflected in the western Great Basin by the general absence of paleo-botanical records between about 8000 and 4000 cal BP and an absence of these records in the western Mojave Desert between about 7500 and 5500 cal BP (Wigand and Rhode 2002).

Despite a warmer climate, pollen and macrofossil records from the Great Basin "indicate gradually increasing annual precipitation punctuated by periodic increases in rainfall abundance" beginning about 5,400 years ago" (Wigand and Rhode 2002:325). Wigand and Rhode (2002) point to a "panregional" event reflecting a shift toward greater rainfall that appears in depositional records and pollen profiles in the northern and western Great Basin. This event may be indicated in the Sierra by a sudden drowning of montane forests by rising waters of Lake Tahoe about 5,700-5,400 years ago (Lindström 1990; Wigand and Rhode 2002). In the lowlands of central California, stratigraphic profiles from Browns Island and Peyton Hill near the mouth of the Sacramento-San Joaquin Delta record episodic high freshwater flows beginning about 5500 cal BP, with at least one significant flood event at about 5700 cal BP (Goman and Wells 2000). Increasing precipitation during this interval may also be reflected in the pollen record from Elkhorn Slough on the central coast, where an upswing in the frequency of pine and oak pollen occurs before 5700 cal BP, peaking around 4200 cal BP (Jones and Waugh 1997; West 1988). In the North Coast Ranges, pollen profiles from Tule Lake record an increase in Douglas fir and tanoak between 6800 and 5800 cal BP, also reflecting an increase in effective moisture in the northwest part of the state (West 1993).

Landscape Record

Several studies from the San Francisco Bay area and eastern Diablo Range document rapid channel filling and over-bank deposition beginning around 6800 cal BP, coinciding with changes identified in other paleoenvironmental records (Meyer 1996; Meyer and Rosenthal 1997; Rosenthal and Meyer 2004a). A similar pattern of rapid deposition is recognized in Sierra meadows as an abrupt and synchronous change from fine-

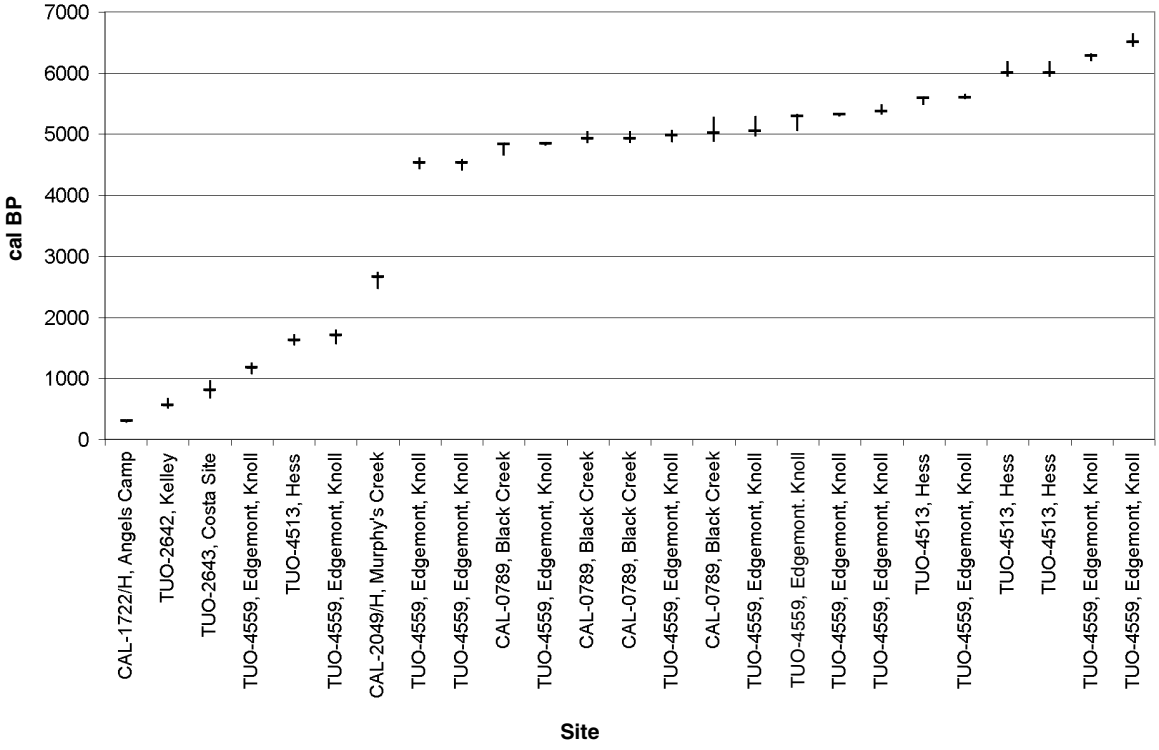


Figure 22. Radiocarbon-Dated Gray Pine Nutshell from the Sierra Nevada Foothills.

grained sediments to poorly sorted and weakly bedded sand and gravel deposits associated with high-energy water flows (Wood 1975:120 1984:7). The age of these deposits are indirectly constrained at the maximum end by buried early Holocene-age soils and tree stumps, and at the minimum end by buried late Holocene-age soils and tree stumps dated between about 3000 and 2500 cal BP.

A similar stratigraphic sequence was identified in the lower foothills of Calaveras County at the Skyrocket site (CAL-629/630). Here an early Holocene land surface was buried by a thick package of yellow gravelly clay between 7765 and 7490 cal BP (La Jeunesse and Pryor 1996a, 1996b), again signaling a sudden shift in climatic and geomorphic processes around the beginning of the middle Holocene. The same geomorphic process is seen at Clarks Flat (CAL-342), where the colluvial fan of Spit B was deposited between about 7500 and 7100 cal BP (Peak and Crew 1990; West and Haynes 1990). At both Skyrocket and Clarks Flat, rapid colluvial deposition near the beginning of the middle Holocene was followed by a prolonged period of landform stability and soil formation as indicated by radiocarbon dates from both natural and cultural contexts. This period of landscape stability is evidenced throughout central California, represented by buried soils in fans and floodplains identified in many of the alluvial valleys of the Diablo Range and adjacent lowlands (Rosenthal and Meyer 2004a). The occurrence of these soils throughout central California suggests that landforms quickly stabilized after an initial episode of deposition, and remained relatively stable through the remainder of the middle Holocene.

Human Occupation

Like evidence for early Holocene occupation, well-substantiated cultural assemblages assignable to the middle Holocene (ca. >5000 cal BP) are rare in District 3 (Figure 23). The distinctive Martis complex is traditionally thought to have emerged in the western Sierra near the end of the middle Holocene (e.g., Elston et al. 1977; Elston et al. 1994; Kowta 1988), although well-dated assemblages older than about 4000 cal BP are not yet reported from the Tahoe-Truckee region or elsewhere in the northern Sierra (Elston et al. 1994). Several radiocarbon-dates from the Martis type-site (PLA-5) range between 5850 and 4275 cal BP (Summit and Pacific Legacy 1999), but derive from unassociated near-surface charcoal, making their cultural attribution questionable. With the exception of a deeply buried stratum that was not sampled at COL-247 (White 2003a, 2003b), and the deepest Stratum at Llano Seco (BUT-233), no other middle Holocene sites have been reported from the Sacramento Valley or within the foothills of the adjacent Coast Ranges. Likewise, a significant gap in the archaeological sequence is reported during the middle Holocene in Clear Lake Basin, thought to be preservation bias related to extensive floodplain erosion and deposition during and shortly after this interval (White et al. 2002). However a single deeply buried human grave was encountered in a buried soil at LAK-509/881. A radiocarbon date of 6880 cal BP was obtained from charcoal in the burial pit while Borax Lake obsidian specimens from this context ranged between 6.1 and 7.3 microns with a mean of 6.8 microns (Compas 1994).

South of the study area in the Sierra foothills of Tuolumne and Calaveras counties, middle Holocene archaeological deposits have been recognized at several sites including Skyrocket (CAL-629/630), Clark's Flat (CAL-342), Texas Charley (CAL-286), Black Creek (CAL-789), Edgemont Knoll (TUO-4559), and Chipper (TUO-4514; La Jeunesse and Pryor 1996a; Moratto et al. 1988; Peak and Crew 1990; Rosenthal 2006; Rosenthal and McGuire 2004). On the opposite side of the San Joaquin Valley, three sites dating to the end of the middle Holocene (6000-4000 cal BP) have been identified on the eastern slope of the Northern Diablo Range, including CCO-696, -637, and -18/548 (Meyer and Rosenthal 1997; Meyer 2006; Rosenthal et al. 2006). Other sites found at various places on the western slope of the Sierra and in the eastern Coast Ranges may have witnessed use during this time interval, but unequivocal evidence is lacking. Obsidian hydration readings from several sites likely evince middle Holocene occupation (see Chapter 5), but this interpretation is clouded by temporally mixed site components (e.g., Jackson 1996; Milliken et al. 1997) and poorly resolved hydration rate conversions especially in the Sierra Nevada (c.f. Jackson and Ballard 1999; Rosenthal 2006; Rosenthal and Meyer 2004c). Compounding the problem in the Sierra may be a pervasive misreading of projectile point sequences, with too much weight given to stylistic-temporal assignments borrowed from the Great Basin (c.f., Elston et al. 1994; Rosenthal 2002, 2006; Rosenthal and McGuire 2004).

East of the Sierra, Pinto points are thought to be diagnostic of the middle Holocene and have typically also been equated to this period in the western Sierra (Elston et al. 1977; Moratto et al. 1988). Likewise, contracting stem

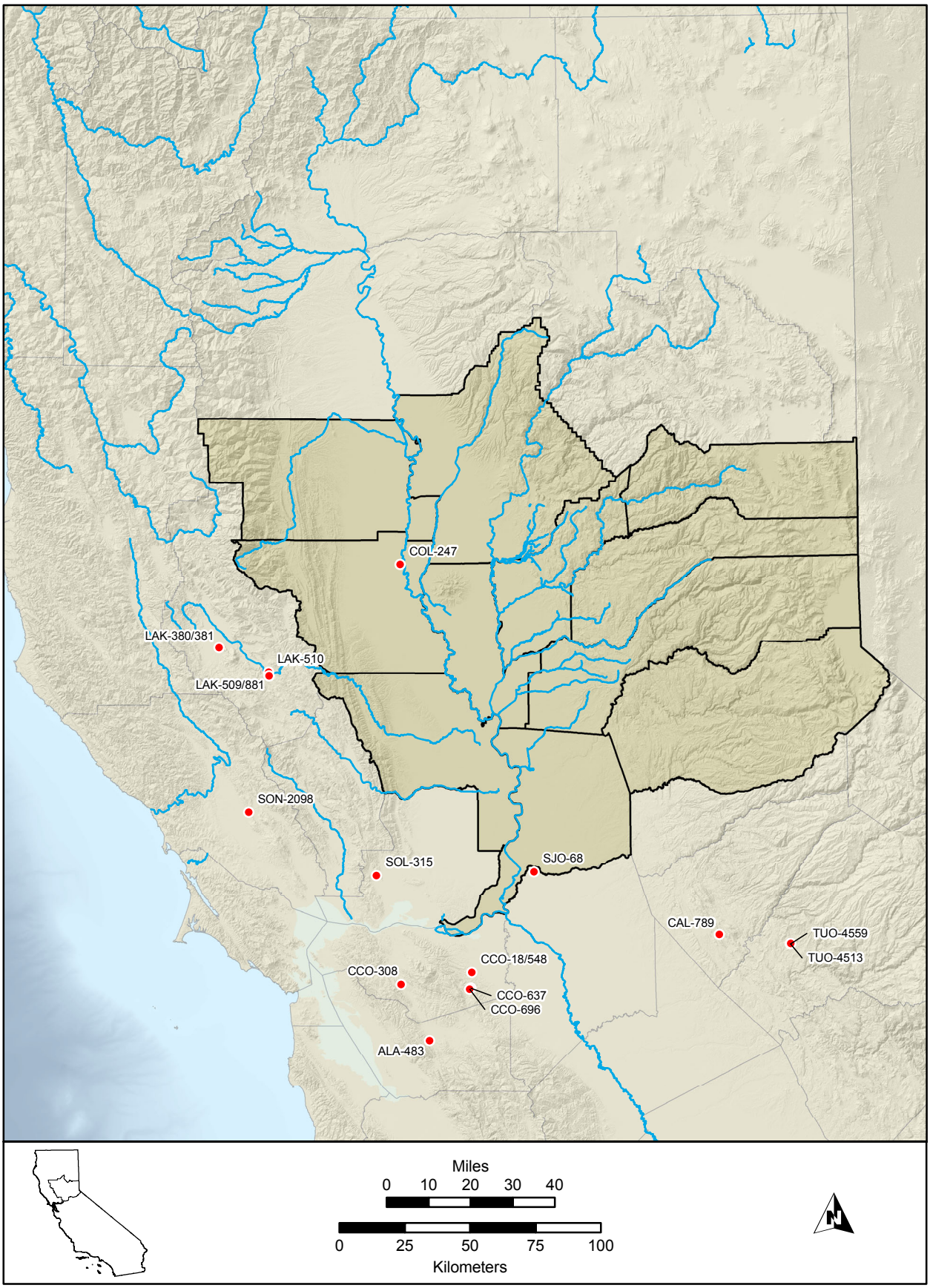


Figure 23. Middle Holocene Sites in Central California.

"Gatecliff" points dating between about 5000 and 3300 BP and corner-notched "Elko" points dating between about 3300 and 1200 BP in the western Great Basin, are typically assumed diagnostic of these same time periods in the Sierra (e.g., Elston et al. 1977; Elston et al. 1994). However, a growing body of recent evidence from the western slope indicates that notched and stemmed dart points may have been in common use through all of the middle and much of the late Holocene (ca. 7000 to 1000 cal BP). For example, middle Holocene components at the Edgemont Site (TUO-4559) in Sonora and at the Black Creek site (CAL-789) near Copperopolis are dominated by corner-notched dart points in stratigraphic contexts radiocarbon dated to between 6200 and 4200 cal BP (Rosenthal 2006). These points are also present in middle Holocene strata at the Texas Charley site (CAL-286) and at Clarks Flat (cf., Moratto et al. 1988; Peak and Crew 1990; Rosenthal and McGuire 2004). Within the current study area, corner-notched points are the most frequent dart form recovered from the deepest strata at ELD-145, PLA-101, -695, -728, and NEV-251, all of which appear to be at least 3,000 years old or older (Baker 2000a, 2000b; Jackson and Ballard 1999; Ritter 1970; Rosenthal 2002; White and Origer 1987). Further, large hydration values are commonly reported for side- to corner-notched points at Yosemite (Hull and Moratto 1999), in the Sonora region (Rosenthal 2006), and elsewhere on the western slope (Jackson and Ballard 1999), confirming that these points have a longevity that exceeds their common temporal range on the east side of the Sierra.

Handstones and millingslabs remained the primary plant processing tools used by native groups living in the foothills and seasonally occupying the high elevation Sierra during the middle Holocene (Kowta 1988); these tools may have also remained the predominant plant processing technology in the foothills of the North Coast Ranges (White and Weigel 2006). Evidence is increasing that gray pine and perhaps acorn made up a significant part of the seasonal diet during the middle Holocene as these nuts crops are the most ubiquitous dietary plant remains found at sites in the foothill woodlands on both sides of the valley (Table 6). Radiocarbon dates ranging between 4200 and 6200 cal BP have recently been obtained on grey pine nutshell from several sites in the foothill

Table 6. Ubiquity of Acorn and Gray Pine in Early and Middle Holocene Flotation Samples.

Site	Reference	# of Samples	Acorn	Gray Pine	^{14}C Range (cal BP)	# of Dates
Early Holocene						
Northern Diablo Range						
CCO-696D	Meyer and Rosenthal (1997)	10	90%	-	9870-7400	3
Sierra Nevada Foothills						
CAL-629/630	Rosenthal and McGuire (2004)	10	70%	60%	10,200-7765	7
Middle Holocene						
North Coast Range						
LAK-509/881	White et al. (2002)	1	100%	100%	6880	1
Northern Diablo Range						
CCO-637	Meyer and Rosenthal (1998)	10	100%	80%	5797-2585	4
CCO-18/548	Rosenthal et al. (2006)	4	100%	100%	6290-5405	4
North Coast Range						
LAK-72E-A	White et al. (2002)	1	100%	100%	4494	1
LAK-510W-C	White et al. (2002)	2	100%	100%	7820-3002	2
SON-2098	Origer (1993)	5	100%	20%	5590-5130	2
Sacramento Valley						
COL-247	White (2003a)	9	100%	-	4385-3575	3
Sierra Nevada Foothills						
CAL-789	Rosenthal and McGuire (2004)	11	91%	100%	5390-2720	8
TUO-4559	Meyer et al. (2006)	8	100%	100%	5660-4820	8
FRE-61	McGuire (1995)	3	67%	-	6760-3010	2

zone of the Sierra, south of the study area (see Figure 22), including the Edgemont Knoll (TUO-4559) and Hess (TUO-4513) sites in Sonora (Rosenthal 2006) and at the Black Creek site (CAL-789) near Copperopolis (Rosenthal and McGuire 2004). This latter site also produced three dates on acorn nutshell ranging between 5150 and 5390 cal BP, while four acorn nutshell dates from Edgemont Knoll range between 8600 and 4750 cal BP (Meyer et al. 2006). Gray pine and manzanita nutlets are also reported from middle Holocene contexts at the Skyrocket site (Moore 1996). On the west side of the Central Valley, in the northern Diablo Range, pine and acorn nutshell and manzanita nutlets are the dominant plant remains found in middle Holocene assemblages at Los Vaqueros (Meyer and Rosenthal 1997, 1998) and at the Marsh Creek site (CCO-18/548; Rosenthal et al. 2006), further indicating that xerophytic nut and berry crops were an important part of the prehistoric economy throughout the foothill woodlands of interior central California between about 6000 and 4000 cal BP.

As early as 6000 cal BP, use of the mortar and pestle is first recorded in lowland sites at various places in central California (Table 7), particularly in marsh-side, riparian, and estuarine settings (Jones 1991 1997; Levulett et al. 2002; Meyer and Rosenthal 1997). In the lowland valleys of the northern Diablo Range, southwest of the current study area, mortars and pestles replaced handstones and millingslabs between 7000 and 6000 cal BP (Table 7), and remained the predominant or exclusive milling technology used throughout the middle and late Holocene (Fredrickson 1966; Meyer and Rosenthal 1997). Pestles and numerous mortar fragments from the Blossom Mound (SJO-68) indicate these tools were in use south of the Delta as early as 5000 cal BP, and a pestle from the deepest sampled stratum at the Reservation Road site (COL-247), dated 4300 to 3500 cal BP, provides a minimum date for the introduction of these tools in the Lower Sacramento Valley. In the lower foothills of the

Table 7. Early and Middle Holocene Ground Stone Assemblages from Central California.

Site	Reference	Stratum	Bowl Mortar	Pestle	Hand-stone	Milling-stone	^{14}C Range (cal BP)	# of Dates
Sierra Nevada Foothills								
CAL-629/630	La Jeunesse and Pryor (1996d)	Green Black and Gray Clay	-	-	61	206	10,200-7765	7
		Tan-gravelly Clay	6	20	43	5	7500-5980	5
		Olive Silt	4	2	13	16	4470	1
		Brown Clayey Silt	12	8	38	10	4415-2720	3
CAL-789	Rosenthal and McGuire (2004)	Stratum II	5	7	18	26	5390-2720	8
TUO-4559	Meyer et al. (2006)	Stratum II	1	2	47	47	4520-6900	22
North Coast Ranges								
LAK-380/381	White and King (1993)	Buried midden	1	1	5	2	13,262-7768	32
LAK-1682	Rosenthal et al. (1995)	Feature 2	-	-	12	4	8093	1
LAK-72	White et al. (2002)	EA-2	-	-	4	8	4494	1
SON-2098	Origer (1993)	Layer 3	3	1	4	2	5590-5130	2
Diablo Range								
CCO-696	Meyer and Rosenthal (1997)	Kellogg Paleosol	-	-	6	3	10,355-7400	6
		Vaqueros Paleosol	25	37	-	-	7210-690	14
CCO-637	Meyer and Rosenthal (1997, 1998)	Stratum I	5	18	-	-	5795-2585	4
CCO-18/548	Wiberg and Clark (2004)	Stratum III	2	1	-	-	3585-3740	4
CCO-308	Fredrickson (1966)	Stratum C	5	1	-	-	5030-2990	2
ALA-483	Bard et al. (1992); Wiberg (1996)	-	4	8	-	-	6180-2830	4
Central Valley								
SJO-68	Ragir (1972); Schulz (1981)	-	22	3	1	3	5000-3195	7
COL-247	White (2003a)	Stratum 3	-	1	3	-	4385-3575	3

Sierra Nevada, this technology first appears in middle Holocene assemblages dated as early as 7000 to 5500 cal BP (see Table 7), but does not appear to have become common in the North Coast Ranges until after 2500 cal BP (White and Weigel 2006), and in the western Sierra until the introduction of the bedrock mortar around 1,000 years ago (Kowta 1988; Rosenthal 2006).

Adoption of the bowl mortar and pestle during the middle Holocene may not have coincided with a shift to new plant foods (c.f. Basgall 1987). As noted above (see Table 6), gray pine and acorn are abundant in plant macrofossil assemblages from both sides of the Central Valley. However, handstones and millingslabs remained dominant in the western Sierra (Rosenthal 2006), while mortars and pestles became the most common milling tools in the Northern Diablo Range and southern Delta. Differences in milling tools may be a function of the energetic trade-off between creating a functional bowl mortar versus a more expedient millingslab; this is further related to contrasting land-use patterns (Rosenthal and McGuire 2004).

Continued use of the handstone and millingslab in the Sierra and North Coast Ranges appears to have been related to an on-going strategy of residential mobility (Rosenthal and McGuire 2004; White et al. 2002). In the uplands, a strong elevational gradient in the seasonal timing and distribution of economically important plants and animals appears to have favored a more mobile settlement system designed to accommodate spatial and seasonal disparities in resource availability (Rosenthal and Wohlgemuth 2006; White and Fredrickson 1992; White et al. 2002). However, use of the mortar and pestle in the Sacramento Valley and adjacent lowlands was likely part of an increased technological investment associated with a shift toward greater residential stability which occurred around the emerging freshwater marshes of the Delta region (e.g., SJO-68) and other well-watered riparian ecosystems (e.g., at CCO-548 along Marsh Creek). This settlement focus was likely facilitated by the aggregation of economically important plants and animals concentrated spatially but dispersed seasonally (Jones 1991 1997). Both characteristics alleviate some of the scheduling conflicts prevailing in environments such as the Sierra, where resources were distributed more homogenously into distinct environmental zones (Rosenthal and Wohlgemuth 2006).

Evidence for increasing residential stability in the Central Valley ca. 5000 cal BP is best represented by the Windmiller Tradition. The earliest of these settlements identified at SJO-68, is among the first sites in central California to include large cemetery populations, specialized tool assemblages, and an abundance of non-utilitarian items. Included are large numbers of well made "charmstones," the earliest shaped *Olivella* wall-beads, *Haliotis* ornaments, and other decorative appurtenances (Heizer 1949; Meyer 2006; Meyer and Rosenthal 1997, 1998; Moratto 1984; Milliken et al. 1997; Ragir 1972; Wiberg and Clark 2004).

As part of the economic intensification thought to have accompanied a more sedentary lifestyle (e.g., Basgall 1987; Bouey 1995; Broughton 1994a), fishing may have taken on new importance in the Central Valley. Specialized fishing gear and fish remains are first represented in assemblages dating to the middle Holocene (Broughton 1988; Meyer and Rosenthal 1997; Ragir 1972; Rosenthal et al. 2006; White 2003a). However, this may simply be a product of the rarity and poor preservation of earlier faunal collections (e.g., La Jeunesse and Pryor 1996e; Meyer and Rosenthal 1997). Heavy reliance on the emerging mosaic of marshes, riparian forests, and adjacent grasslands is further indicated by the composition of faunal assemblages attributed to the late middle Holocene. Tule elk, mule deer, and pronghorn, are all represented as are smaller rabbits and hares, cranes, geese, swans, ducks, cormorant, turtle, river otter, beaver, coyote, and several other terrestrial carnivores, raptors, and rodents (Ragir 1972:159).

By the end of the middle Holocene (5000-4000 cal BP), regionally specific cultural traditions are evident in the lowlands surrounding the Delta, reflecting the co-existence of distinct socio-cultural groups and further implying that territorial circumscription may have been well established in the valley by this time. The distinctive Windmiller culture is primarily recognized from a handful of sites located at the confluence of the Mokelumne and Cosumnes rivers. Windmiller sites are unique in their abundance of westerly oriented ventrally extended burials and elaborate material culture found as burial offerings (Heizer 1949; Ragir 1972). On the north and west sides of the Delta, separate cultural groups who used flexed burial postures are known from several sites (Meyer and Rosenthal 1997; White 2003a; Wiberg 1992). At Green Valley in Solano County, late middle Holocene burials from SOL-315 were found capped by milling tools and rock cairns (Wiberg 1992). Recent radiocarbon dates indicate these interments are greater than 4,000 years old and coeval with the Windmiller Tradition in the eastern and southern Delta (Wohlgemuth and Rosenthal 1999). Similarly, middle Holocene human interments

excavated on the west side of the Delta at Los Vaqueros (Meyer and Rosenthal 1997), CCO-18/548 (Rosenthal et al. 2006), and elsewhere in the Bay Area (Fredrickson 1966; Gerow with Force 1968; Price et al. 2006), are commonly found in flexed postures and lack many of the material culture elements associated with Windmiller graves, particularly the well-fashioned charmstones. Other commodities, such as obsidian from eastern Sierra and North Coast Range quarries and *Olivella* shell beads and shell ornaments are found among most lowland groups, attesting to the social and economic articulation of these separate cultures during the middle Holocene.

LATE HOLOCENE (4000 CAL BP-AD 1850)

Environment

During the late Holocene, pollen records from central and northern California suggest a return to more mesic conditions, with increased precipitation and less pronounced seasonal temperature variations, more characteristic of the modern climate (West 2000). At higher elevations in the North Coast Ranges, Douglas fir begins to expand between 3800 and 2300 cal BP, and most pollen records studied by West (1993) show an increase in pine and a decrease in oak. In the Sierra, the upper tree line migrated downslope some 32 meters (105 feet) between 3400 and 2900 cal BP (Scuderi 1987) characteristic of declining mean temperatures. At about this same time (4000-2000 cal BP), pollen profiles from Swamp Lake in Yosemite show a shift to more mesic species with increasing incense cedar and fir and decreasing oak values interpreted as a continuation of mid-Holocene cooling trends (Smith and Anderson 1992). Greater abundance of charcoal in these sediments is thought to be a product of increased fire frequency and more pronounced seasonal drought (Smith and Anderson 1992). Elevated fir pollen frequencies are noted at Lake Moran where beginning 3800 cal BP (Edlund 1991) and in the Southern Cascade at Willow Lake beginning 3400 cal BP (West 2005). At Balsam Meadow, Davis et al. see a simultaneous increase in fir, incense cedar, and oak relative to pine pollen beginning about 3100 cal BP "consistent with a lowering of vegetation zones and cooler and/or wetter climate" (1985:330). A slightly later date of 1800 cal BP is reported for the increase in fir pollen at Exchequer Meadow to the south (Davis and Moratto 1988). This date, however, correlates reasonably well with peak late Holocene fir values at Dinkey Meadow (1940 cal BP) and Balsam Meadow (1623 cal BP). Cooler conditions are also evident beginning about 3200 to 2500 cal BP by the elevational lowering of mountain hemlock and grand fir at high and mid-elevation meadow sites studied by Anderson (1990). Increased effective precipitation during the late Holocene is also indicated by the development of wet-meadows across much of the western slope of the Sierra, beginning as early as 5000 cal BP at some locations, but widespread by 3000 cal BP (Koehler and Anderson 1994; Smith and Anderson 1992; Wood 1975). Floral and pollen records from the western Great Basin indicate an expansion of western Juniper woodland into sagebrush steppe beginning perhaps 4,500 years ago increasing dramatically about 3,700 years ago (Wigand and Rhode 2002). A similar pattern is seen in the southern Great Basin where pinyon-juniper woodland began expanding about 3,800 years ago culminating at 2300 cal BP (Wigand and Rhode 2002).

River Flows and Lake Levels

Study of plant macrofossils in stratified tidal marsh deposits in Suisun Bay indicates a shift from brackish to fresh water conditions between about 3800 and 2000 cal BP, reflecting a period of increased summer flow from the Sacramento and San Joaquin rivers (Goman and Wells 2000; Malamud-Roam et al. 2006; Wells and Goman 1995). Similarly, Davis (1999) reports a significant high stand at Tulare Lake between 3775 and 2560 cal BP. This roughly correlates with freshwater conditions identified at Elkhorn Slough peaking around 4200 cal BP (cf., Jones and Waugh 1997). As well, a significant flood event identified at 3600 cal BP in the Sacramento-San Joaquin Delta (Goman and Wells 2000) parallels a brief lake stand on the Silver Lake playa in the Mojave Desert, dated to 3900 cal BP (Enzel et al. 1989, 1992). Mono Lake reached its highest levels since the late Pleistocene at about 3800 cal BP, as did Owens Lake (Benson et al. 2002; Stine 1990). Similarly Lake Tahoe rose to its sill level by about 3100 cal BP and Pyramid Lake expanded (Benson et al. 2002). Other localities in the southern Great Basin also evince a wetter interval about this time. Walker Lake reached a high stand between 4,000 and 2,900 years ago and wetter periods are indicated in Lower Pahranagat Lake and Diamond Pond about 3,700 and 2,700 years ago (Wigand and Rhode 2002) and at Searles Lake at 3,800 years ago (Smith 1979; Stine 1990). These records clearly mark an abrupt end to the extended warm-dry middle Holocene in the Great Basin.

Late Holocene salinity profiles recorded in marsh deposits from Suisun and San Pablo bays are quite variable reflecting both local conditions and estuary-wide fluctuations in freshwater flow. Several, often contradictory, records of high and low salinity levels are recorded in the estuary (c.f. Byrne et al. 1998; Ingram and DePaolo 1993; Ingram et al. 1996; Malamud-Roam et al. 2006). For example lower freshwater flows and high salinity in the Sacramento-San Joaquin Estuary between about 3000 and 2500 cal BP are indicated by the carbon isotope composition and high frequency of pollen from salt-tolerant plants in marsh deposits at Rush Ranch in northern Suisun Bay (Byrne et al. 2001). However, several other paleoclimatic records from the estuary suggest relatively low salinity levels during this period (Ingram and DePaolo 1993; Malamud-Roam et al. 2006). The latter is more in line with regional pollen evidence for comparatively wet-conditions in the Sacramento watershed after 3800 cal BP. Studies of marsh deposits and analysis of oxygen isotopes in bay-dwelling shellfish deposits reveal significant high flow events in the Sacramento watershed between 1900 and 1600 cal BP (Ingram et al. 1996) 750 cal BP (Byrne et al. 2001) and about 500 and 350 cal BP (Ingram et al. 1996; Wells and Goman 1995). These latter two intervals correspond to other records from the bay-estuary, showing low salinity levels (Malamud-Roam and Ingram 2004; Malamud-Roam et al. 2006) and match high stands at Mono Lake (Stine 1990) at 550-465 and 375-290 cal BP. Tree-ring studies document additional high-flow events in the Sacramento River watershed at 825 and 600 years ago, which closely match Mono Lake high stands around 866 and 680 to 605 cal BP (Meko et al. 2001; Stine 1990).

Pollen profiles from Pearson's Pond in San Mateo County reflect a dry period in central California between 1950 and 1550 cal BP (Adam 1975). This corresponds to a drought interval recorded in Giant sequoia tree rings from the southern Sierra at 1714 to 1773 cal BP (Hughes and Brown 1992), and partially overlaps with a period of high salinity at Rush Ranch in Suisun Bay between 1750 and 750 BP (Byrne et al. 2001). The wet period identified by Adam (1975) between 2300 and 1950 cal BP corresponds to freshwater conditions at Rush Ranch between 2500 and 1750 cal BP (Byrne et al. 2001); however, a dry interval from 1950 to 1550 cal BP contradicts the Rush Ranch record and other isotope studies from the estuary (Ingram et al. 1996). The latter, indicate higher freshwater flows during this period (Ingram and Byrne 1998; Ingram et al. 1996). As Goman and Wells (2000) point out, however, there are significant problems in the temporal resolution of the isotope data. In contrast, the Mono Basin record is largely consistent with the findings of Adam (1975), as a coeval low stand is recorded about 1800 cal BP and high a stand at 1370 cal BP (Stine 1990).

Two periods of drought known together as the medieval climatic anomaly, are recognized by low stands of Mono Lake between 1100 and 890 cal BP and 790 and 650 cal BP (Stine 1994). This late Holocene climatic perturbation is evident across the west (Jones et al. 1999) roughly coinciding with "an extreme hydrological event" (Ingram et al. 1996) in the Delta sometime between 1670 and 750 cal BP, and high salinity levels in the bay-estuary between 1000 and 800 cal BP (Byrne et al. 2001; Malamud-Roam and Ingram 2004; Malamud-Roam et al. 2006). This is consistent with reconstructed Sacramento River flows using tree-ring data, which suggest droughts occurred about 1,020 and 700 years ago (Meko et al. 2001). Meko et al. (2001), however, indicate the most severe drought in the last 1,100 years occurred in the Sacramento watershed 420 years ago. This interval of drought is also recorded in the southern Sierra between 482 and 370 cal BP by growth rings in Giant Sequoia (Hughes and Brown 1992).

Matthes Glaciation

By about 650 cal BP warm, dry conditions of medieval times began to give way to the Little Ice Age in the Sierra Nevada, also known as the Matthes glaciation (Matthes 1939). This neo-glacial period reached its peak about AD 1850 and declined thereafter, ending about 1900 (Guyton 1998; Stine 1996). It is generally thought that this climatic shift was triggered by reduced solar activity which changed the atmospheric circulation of the winter storm track over the northern Pacific (Graham 2004). Increased precipitation and lower temperatures (1.0-2.0 °C cooler than today) led to greater snowfall and the expansion of glaciers during this interval. These changes are reflected in isotopic, lake sediment, macrofossil, pollen, and tree-ring records from throughout California (Stine 1996), along with a decrease in the frequency of fires as monitored by reduced quantities of charcoal (Swetnam and Baisan 2003). The Little Ice Age is the only widely recognized period of glacial growth in the Sierra during the Holocene, and the coldest period in at least the past 11,000 years.

Landscape Record

Variability in regional climate during the late Holocene is also reflected in the stratigraphic record of many alluvial landforms in central California. Floodplains and fans throughout the valleys of the Coast Ranges record multiple periods of stability and soil formation followed by brief episodes of sediment deposition (Rosenthal and Meyer 2004a, 2004b). These latter intervals of landscape instability are indicated by localized depositional events occurring about 4,000, 2,800, 1,300, and 650 years ago (Rosenthal and Meyer 2004a, 2004b). Roughly synchronous periods of fan and floodplain deposition are also recognized on the western slope of the Sierra (Meyer and Dalldorf 2004) and in the Sacramento Valley (White 2003b). Regional cycles of deposition and stability appear to be responding to fluctuations in precipitation and local changes in vegetation cover, which at different times during the late Holocene stabilized the landscape and alternatively made it prone to widespread erosion and deposition (Rosenthal and Meyer 2004a, 2004b).

Human Occupation

Evidence for late Holocene human occupation in central California is extensive, particularly for the last 2,500 years. Radiocarbon and obsidian hydration information indicate sustained and widespread occupation with late Holocene sites known from virtually every habitat in the study area. The cultural diversity first apparent in the middle Holocene becomes much more pronounced in the late Holocene, reflected by a complex mosaic of distinct socio-political entities marked by contrasting burial postures, artifact styles, and other elements of material culture (e.g., Bennyhoff and Fredrickson 1994). Perhaps as a result of greater temporal resolution and a much larger archaeological record, economic, technological, and socio-cultural developments are much better understood for the late Holocene than for proceeding time periods.

Three primary chronological divisions are recognized during the late Holocene in central California: the Early, Middle, and Late periods (e.g., Bennyhoff and Hughes 1987; Groza 2002; Rosenthal et al. 2007). The Early Period (4000 to 2500 cal BP) is the least understood, due mainly to an under-representation of sites older than 2,500 years. Within the Sacramento Valley, archaeological deposits associated with the deepest sampled strata at Reservation Road (COL-247) and the Wurlitzer Site (BUT-294) fall within the Early Period, as does a portion of GLE-105 (Table 8). In the Delta region, Windmiller components at the Windmiller site (SAC-107), Stone Lake site (SAC-145), and SAC-168 also fall within the Early Period of the late Holocene (Table 8; Figure 24). Several sites in the Sierra Nevada foothills and montane regions have produced Early Period radiocarbon dates, while both GLE-217 and COL-81 in the foothills of the Coast Range have been dated to this interval (Table 8).

Sites from the Middle Period of the late Holocene (2500 to 740 cal BP; Groza 2002) are much more abundant and widely recorded in central California than those from preceding time periods. In fact, no fewer than 42 sites in District 3 have been radiocarbon dated to the Middle Period, including 25 from the Sacramento Valley, 16 from the Sierra Nevada, and just one from the east side of the Coast Range. The Late Period is equally well represented in the study area, with 25 radiocarbon-dated sites; 16 from the Sacramento Valley, 11 from the Sierra Nevada, and two from the Coast Ranges (Appendix A).

A number of different late Holocene cultural complexes have been identified by archaeologists working within the District 3 study area. In the northern Sierra Nevada and southern Cascade ranges, the Mesilla and Bidwell complexes are associated with the Early and Middle periods, whereas the Sweetwater and Oroville complexes are thought to date to the Late Period (Kowta 1988). To the south, in the Sierra Nevada, the Martis Complex spans the Early and Middle Periods (Elsasser 1960; Elston et al. 1994), while the King Beach Complex (Early and Late Phases) is associated with the Late Period. In the Sacramento Valley and Delta regions, the Windmiller Tradition continues into the Early Period of the late Holocene, although other unnamed cultural complexes are also present in the lower Sacramento Valley (e.g., White 2003a; Weldon 1990). The Middle Period is characterized by what Fredrickson (1973, 1974) refers to as the Berkeley Pattern, subdivided into numerous sequential phases and geographic districts (e.g., Bennyhoff and Fredrickson 1994). Berkeley Pattern sites are also recognized in the major valleys and large drainage systems of the southern North Coast Ranges (Basgall and Bouey 1991; White 1984; White and Fredrickson 1992; White et al. 2002), alongside separate cultural traditions subsumed into the Mendocino Pattern (Hildebrandt 2007; White and Fredrickson 1992;

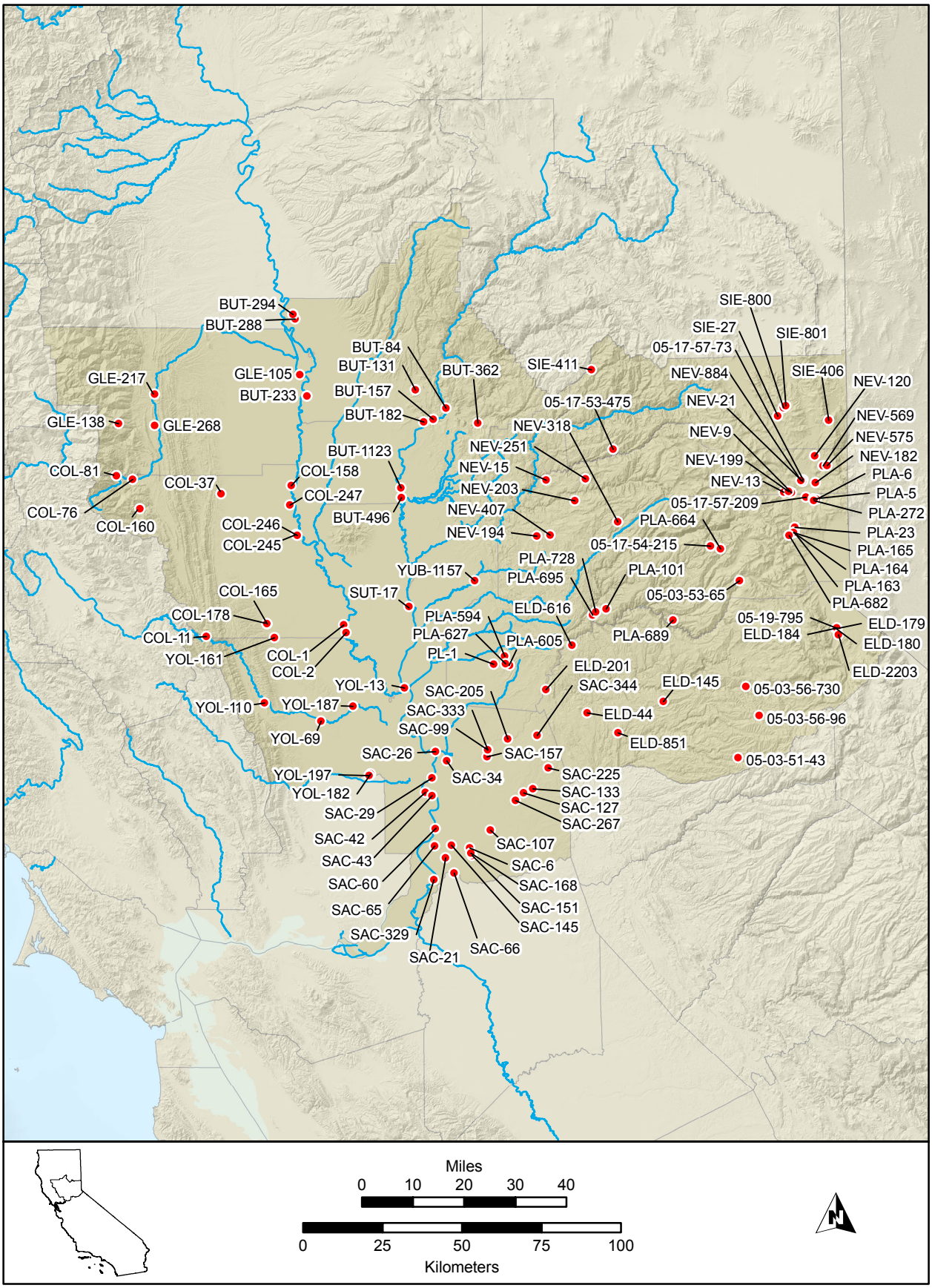


Figure 24. Selected Late Holocene Sites in Central California.

Table 8. Archaeological Sites in District 3 with Early Period (4000-2500 cal BP) Radiocarbon Dates.

Site	^{14}C Range (cal BP)	# of dates	Reference
Sacramento Valley			
BUT-294	4465-2570	3	Zancanella (1987)
GLE-105	2600	1	Bayham and Johnson (1990)
COL-247	4400-2755	7	White (2003a)
SAC-107	3270-2790	2	Schulz (1981)
SAC-145	3545	1	Schulz (1981)
SAC-168	3252	1	Ragir (1972)
Sierra Nevada			
BUT-157	2955-2930	2	Breschini et al. (1996)
PLA-101	3597	1	Ritter (1970)
NEV-120	2951	1	Peak and Associates (1988)
NEV-194	4164-3459	2	Clewlow (1984)
NEV-407	3325-2646	3	Clewlow (1984)
PLA-5	3474-2959	2	Summit and Pacific Legacy (1999)
PLA-165	2865	1	Lindström (2005)
PLA-695/H	4030	1	Baker (2000a)
Coast Range			
GLE-217	3169-2747	3	White and Weigel (2006)
COL-81	3615	1	Slaymaker (1983)

White et al. 2002). Sites associated with the latter tradition are found throughout the mountainous uplands of the southern North Coast Ranges. The Late Period record in the Sacramento Valley and adjacent uplands to the west is characterized as the Augustine Pattern (Bennyhoff 1994; Fredrickson 1974), and farther north in the valley and Coast Range as the Gunther Pattern (Hildebrandt 2007).

Hill People and Valley People during the Early and Middle Periods

Although a high degree of cultural diversity is apparent in central California, there appears to have been two fundamental adaptations that occurred side-by-side during the Early and Middle periods. The archaeological record of the Sacramento Valley and adjacent portions of the Coast Range and Sierra-Cascade range clearly reveals such differences in adaptation, and speak to a sort of environmental niche differentiation among cultural groups prevailing in central California throughout much of the late Holocene. During the Early and Middle periods, upland groups seem to have lived in low-density communities, employed generalized and expedient tools designed for a variety of extraction and processing tasks, and relied on seasonal movements to accommodate changes in resource productivity—an adaptation most akin to what Binford (1980) referred to as "foragers." On the other hand, groups who occupied the lowland valleys of central California appear to have lived in comparatively high-density villages, utilized a broad range of specialized technologies, and worked logistically from permanent or semi-permanent settlements to obtain resource surpluses for storage and exchange—"collectors" by Binford's (1980) definition.

No later than 4000 cal BP, residentially stable communities had emerged throughout the Sacramento Valley along the lower stretches of the Sierra rivers, and in the major valley systems of the North Coast Ranges (e.g., Clear Lake Basin). Evidence for these communities includes large mounded settlements and smaller satellite villages found on levee ridges and other elevated landforms along the major rivers and tributary streams (e.g., Bouey 1995; Heizer 1949; Lillard et al. 1939; Moratto 1984; Ragir 1972; Schulz 1981). Extended residential occupation is indicated by the presence of well-developed middens often containing hundreds of human graves, storage pits, structural remnants, and other types of domestic features (e.g., hearths ash dumps), as well as seasonally diverse

faunal and floral remains (Bouey 1995; Broughton 1994b; Lillard et al. 1939; Moratto 1984; Rosenthal et al. 2006; Simons 1992; White 2003a, 2003b; White et al. 2002; Wiberg and Clark 2004; Wohlgemuth 2004).

As noted above (see middle Holocene *Human Occupation* on page 59), by the Early Period mortars and pestles became much more common in Central Valley sites (Basgall 1987; Rosenthal and McGuire 2004), but were not used exclusively (Figure 25). Fishing gear (e.g., harpoons, hooks, net weights, mesh gauges), hunting-related equipment (e.g., projectile points, atlatl spurs, bone "shaft wrenches"), wood-working tools (e.g., elk antler wedges), and tools used to fabricate other implements (e.g., bone awls, stone drills) are common in Early and Middle period settlements from the lowland valleys reflecting a high degree of technological investment and specialization. A broad range of non-local commodities are also found in lowland sites from the late Holocene (e.g., alabaster, quartz crystals, actinolite, hemitite), the most common being marine shell beads and ornaments from the nearby Pacific coast, and obsidian from quarries in northern and eastern California (Ericson 1977; Jackson 1974; Meacham 1979; Ragir 1972).

In the adjacent foothills and mountainous regions of the Sierra Nevada and Coast Ranges, seasonal mobility appears to have remained quite high during most of the Early and Middle periods. Functional assemblages from upland regions in the Sierra Nevada and Coast Ranges include a diverse set of expedient cobble-based pounding, chopping, and mulling tools, including the almost exclusive use of handstones and millingslabs (Figure 25; e.g., Baker 2000a, 2000b; Clewlow et al. 1984; Delacorte and Basgall 2006; Jackson and Ballard 1999; White and Origer 1987; White and Weigel 2006).

Flaked stone collections from the uplands are often dominated by highly curated bifaces, heavily reworked dart points of various styles, and simple flake tools, most commonly made from local toolstones (e.g., Jackson and Ballard 1999; Payen et al. 1989; Rosenthal 2006; White 1984; White and Origer 1987; White et al. 2002). Specialized flaked stone, ground stone, and bone tools are very uncommon, while personal adornments and other prestige goods including tabular stone pendants, incised slate ornaments, and perforated stone plummets are rare, but widespread (e.g., Jackson and Ballard 1999; Rosenthal 2006; White and Weigel 2006). More importantly, virtually no shell beads or shell ornaments have been encountered in these upland sites (e.g., Jackson and Ballard 1999; Kowta 1988; Payen et al. 1989; Rosenthal 2006; White 1984; White and Origer 1987; White et al. 2002), and non-local commodities in general are rare, limited to obsidian from the most proximal sources (e.g., Basgall and Bouey 1991; Dowdall 2002; Fredrickson 1974; Hildebrandt 1997; Rosenthal 2006; Stewart 1993; White et al. 2002).

Late Period Adaptations and Technology

Upland adaptations changed after 1000 to 700 cal BP with a transition to the Late Period, which Fredrickson (1973) refers to as the Emergent. At this time evidence for extended residential occupation first occurs in upland regions throughout central California. Small villages and hamlets are established throughout the foothills of the Sierra-Cascade and North Coast ranges, characterized by small discrete midden deposits containing seasonally diverse dietary remains, specialized flaked and ground stone tools, and various kinds of bone implements (Kowta 1988; Ritter 1968; Moratto 2002). Late Period villages in the uplands frequently contain house floors, human graves, and other residential features consistent with extended occupation (Jewell 1964; Kowta 1988; Ritter 1968; Moratto 2002).

In the Sacramento Valley large populous towns developed along the Sacramento River where fish weirs were constructed. Similar mound-villages and smaller hamlets were established in the Delta region and along major tributary streams. Fishing appears to have taken on a more important role in lowland economies as fish remains and fishing gear are more abundant than in earlier periods, including several types of bone harpoons, fish hooks, and gorge hooks (e.g., Bennyhoff in Elsasser 1978:78; Moratto 1984:211). A local form of pottery known as Cosumnes Brownware, was made in the lower Sacramento Valley (Johnson 1990; Kielusiak 1982), and baked-clay balls, probably used for cooking, are a common constituent in lowland sites where stone is absent.

Important shifts in material culture and technology are evident beginning in the Late Prehistoric Period, including the first appearance of big-head effigy ornaments thought to be related to the religious movement of the Kuksu Cult (e.g., Atchley 1994). Other items, including stone pipes incised bone tubes and ear spools, are

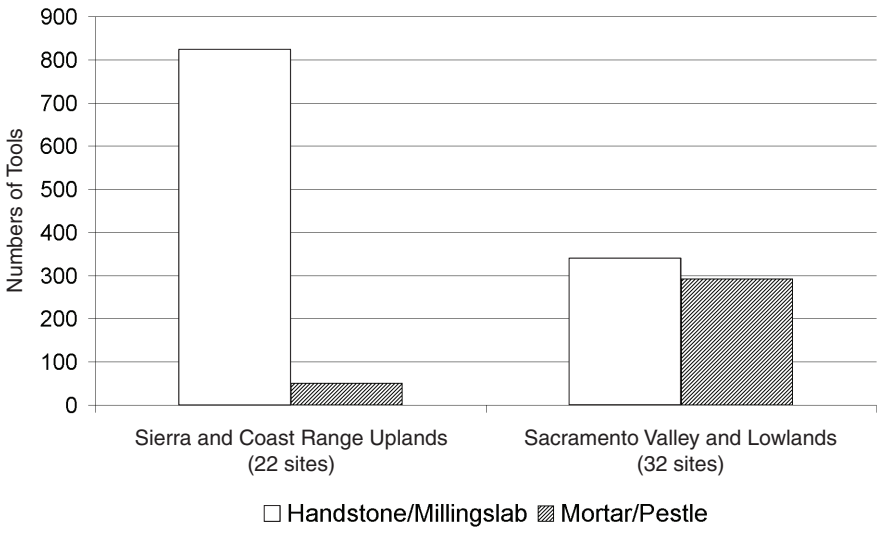


Figure 25. Distribution of Late Holocene Milling Tools in Uplands and Lowlands of District 3.

diagnostic of this period (e.g., Bennyhoff and Fredrickson 1994; Kowta 1988). Of particular interest is the introduction of the bow and arrow, which replaced the dart and atlatl in different portions of central California between about 1100 and 700 cal BP. During this period, the most unique arrow point style in California was developed in the Delta or adjacent regions to the west, known as the Stockton Serrated point (Dougherty 1990; Johnson 1940). While other point styles found in the Sierra, Sacramento Valley, and North Coast Ranges have morphological similarities to arrow points found across much of California, and may have been adopted from neighboring groups, the Stockton Serrate is clearly an independent invention. If revisions to the timing of the central California sequence are correct (Groza 2002), widespread use of the bow and arrow in the Delta may not have occurred until as late as 740 cal BP, when the Stockton Serrated point was first introduced during the early part (Phase 1) of the Late Period.

In the Sacramento Valley, however, the bow and arrow appears to have first been employed several hundred years earlier, based on the occurrence of Gunther-barbed arrow points in well-dated burial contexts in Sacramento and Butte counties (Table 9). Radiocarbon dates from SAC-21, BUT-496, and -584, suggest that these points were introduced no later than about 975 cal BP (Table 9). Contracting-stem, Gunther-like points are found widely across the North Coast Ranges, Sacramento Valley, and western Sierra-Cascade Range, and are commonly regarded as the earliest arrow point in northern California (Jaffke 1997). The oldest, directly dated Stockton serrated points from the study area are consistent with a later introduction (Table 9), but their earliest use remains poorly known. By the end of the Late Period, Desert Side-notched points are found throughout the western Sacramento Valley, Delta region, and across the Sierra-Cascade Range; most likely introduced into western California from the Great Basin. The oldest directly dated examples from District 3 are just 250 years old (Table 9), but Desert Side-notched points may have been widely used in the Sierra by as early as 610 cal BP (Rosenthal 2006). In the lower Sacramento Valley, these points were not used exclusively, often found in assemblages with other local arrow-point styles (e.g., Stockton Serrated and small Corner-notched). Further, Desert Side-notched points are rare west of the Sacramento River. Instead, small corner-notched arrow points were commonly employed during Phase II, similar to those found in the southern North Coast Range, sometimes referred to as "Rattlesnake Corner-notched" (Jaffke 1997; White et al. 2002).

Widespread use of the mortar and pestle in upland settings also occurs during the Late Period, commonly represented by major investments in fixed bedrock milling facilities. The exact timing of the introduction of this important technology is poorly defined, but appears to have occurred in the northern Diablo Ranges around 1300 cal BP based on radiocarbon dates from a stratified cultural deposit in the Los Vaqueros Reservoir area (Meyer and Rosenthal 1997). A similar date for the introduction of the bedrock mortar is proposed for the southern Sierra, but supporting evidence is lacking (Jackson 1984; Stevens 2003). In the central Sierra near Sonora, bedrock mortars appear to have been adopted no earlier than about 1100 cal BP (Rosenthal 2006). Continued use of the handstone and millingslab in most upland regions of the Sierra Nevada is evinced by the appearance of these tools in Late Period middens (Kowta 1988) and by the co-occurrence of millingslicks and mortar cups on bedrock outcrops.

Table 9. Oldest Directly Dated Arrow Points from District 3.

LAB. NO.	SITE	FEATURE	MATERIAL	^{14}C BP	CAL BP	POINT TYPE
UCR-183	BUT-584	Structure 18	charcoal	240 ± 150	270	Desert Side-notched
CAMS-79703	YOL-187	Burial 2	*Olivella* shell	1160 ± 30	540	Stockton Serrated
CAMS-79486	YOL-187	Burial 2	*Olivella* shell	1200 ± 80	570	Stockton Serrated
Beta-150246	BUT-496	Burial 23	*Olivella* shell	1440 ± 40	750	Gunther-barbed
Beta-146853	BUT-496	Burial 33	*Olivella* shell	1580 ± 50	910	Gunther-barbed
UCR-184	BUT-584	Burial 117	bone collagen	1000 ± 150	925	Gunther-barbed
Beta-150245	BUT-496	Burial 5	*Olivella* shell	1620 ± 50	940	Gunther-barbed
UCR-198	SAC-21	Burial 18	bone collagen	1050 ± 150	975	Gunther-barbed

Notes: A date of 1690 ± 55 BP (1600 cal BP) was reported in the 1970s on bone collagen from Burial 33 at BUT-496 but appears erroneous. The recently obtained date from Burial 33 is consistent with other dates from the site and associated shell beads; marine reservoir correction of 225 ± 35 used for *Olivella* dates. See Appendix A for references.

Late Holocene Subsistence

Dietary plant assemblages differ between valley and upland regions during most of the late Holocene (Rosenthal and Wohlgemuth 2006). Acorn makes up between 60 and 80% of all nutshell in lowland central California sites from the Early through Middle periods (Figure 26), whereas, in upland sites, acorn never makes up more than 20% of the total nutshell; instead, the charred shell of gray pine is most abundant (Figure 26; Wohlgemuth 2004; Rosenthal and Wohlgemuth 2006). It is not until the beginning of the Late Period, that acorn became important at upland sites in the Sierra Nevada, when this nutshell reaches proportions equal to that of the Central Valley (Figure 26). This increase correlates well with the introduction of the bedrock mortar in upland regions during the Late Period.

Like the plant remains, faunal assemblages from upland and lowland sites also differ significantly during the late Holocene. In the foothills and higher elevations of the Sierra Nevada, large mammal remains—most certainly deer—make up the vast majority of dietary bone at these sites, accounting for 70% or more from all time periods (Figure 27). In contrast, sites from the Central Valley include no more than 45% large mammal bone, reaching peak amounts during the Middle Period (34%) and latter part of the Late Period (Phase II; 45%; Figure 27).

Further, within the Central Valley, substantial variability is also apparent in the representation of different artiodactyls at sites located in different habitats (Figure 28). Elk bone makes up the great majority of remains at sites surrounding the Delta, but occurs in much lower frequencies at sites from the open plains and woodlands in the Sacramento Valley, and lower foothills of the Coast Ranges. In these latter sites, proportionally more deer have been identified (Figure 28). As might be expected given the dry, open plains of the San Joaquin Valley, pronghorn is the dominant species in sites south of the Delta, but occurs only in small proportions in the Sacramento Valley-Delta region and in the Coast Range foothills (Figure 28).

Although fish remains are rare in the foothills and upper elevations of the Sierra and Coast Ranges, fish bone accounts for a significant proportion of dietary bone at sites in the Sacramento Valley (Broughton 1988; Schulz 1981; White 2003a). Like the artiodactyls, sites from different environmental settings in the valley reveal substantial variability in the representation of fast- versus slow-water fishes (Broughton 1988, 1994b; Schulz 1981). Late Holocene sites located around the Delta and along the Sacramento River are dominated by slow water fish species, while sites along the many side streams of the valley include proportionally more resident fast-water species and anadromous fishes, including salmon and sturgeon (Figure 29).

Exchange

Exchange networks, already in place by at least the middle Holocene, expanded significantly during the late Holocene. *Haliotis* ornaments and large quantities of shell beads manufactured in southern California and along the central and northern California coast, are found in residential sites throughout the Sacramento Valley and lower foothills of the Sierra and Coast ranges. These beads were likely made by just a few communities along the coast (Rosenthal n.d.). *Olivella* wall-beads predominated (Bennyhoff and Hughes 1987) until some time around 300 to 400 years ago when clam-shell disk-beads became widely used. At this time, the nature of bead manufacturing changed from a centralized system to one in which many households made and used beads, perhaps as a form of currency (Chagnon 1970; Rosenthal n.d.). Clam shell bead blanks bead-making debris and bead drills are commonly found at Late Period, Phase II sites extending from the Pacific coast in Marin and Sonoma counties through the southern North Coast Ranges and across the southern Sacramento Valley to the western side of the Sacramento River (Figure 30). Within the current study area, bead-making evidence is only found in this circumscribed region of western Sacramento Valley (Figure 30); although clam shell disk beads occur widely throughout the valley and adjacent foothills.

During the late Holocene, people living throughout the region now encompassed by District 3, were important consumers of obsidian from east of the Sierra Nevada and the North Coast Ranges (Ericson 1977; Jackson 1994; Jackson 1974). Stoneworkers at three main quarries (Napa Valley, Borax Lake, and Bodie Hills) manufactured bifacial rough-outs and finely finished bifacial blades that were widely distributed in central California during the Early and Middle periods. During the Late period, however, quarry production declined,

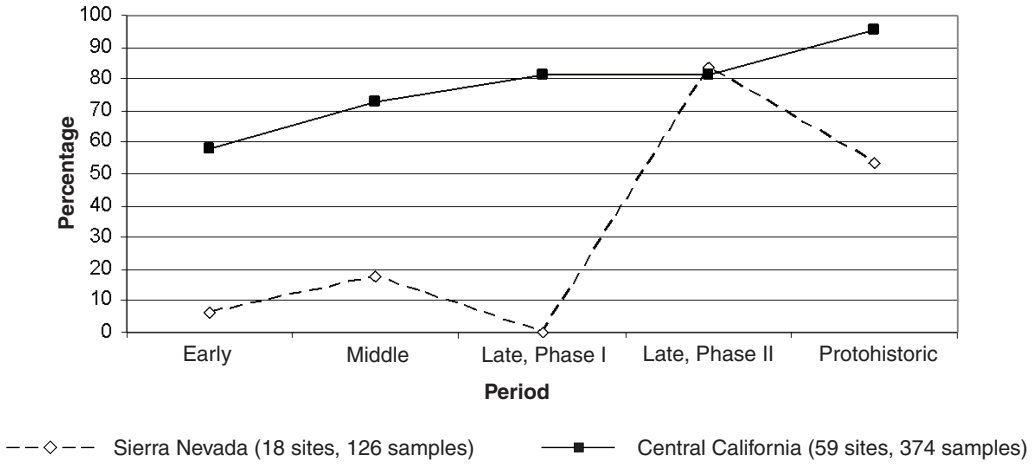


Figure 26. Frequency of Acorn Nutshell in Late Holocene Sites in Central California.

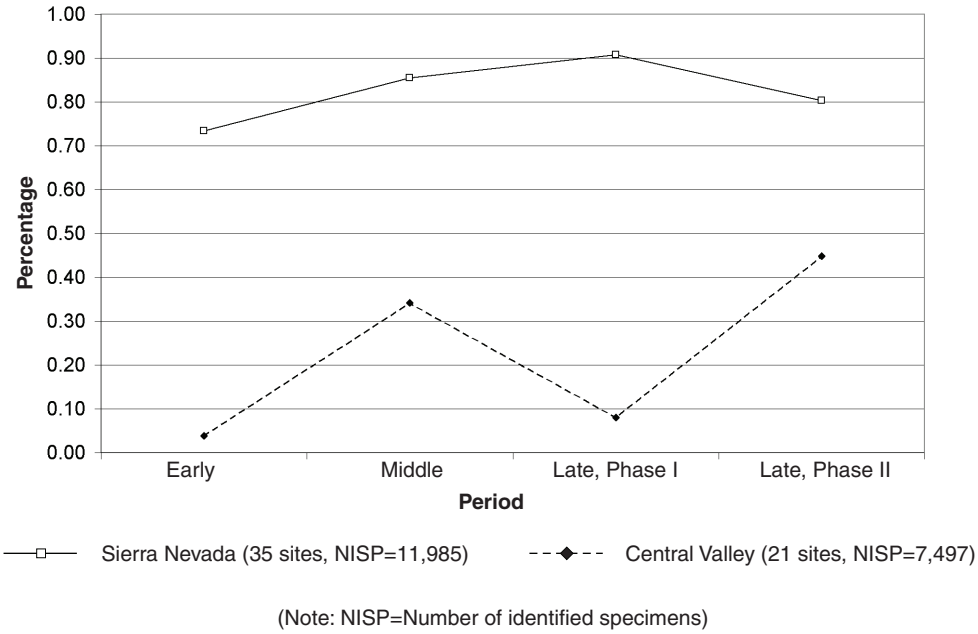


Figure 27. Frequency of Large Mammal Bone in Late Holocene Sites in Central California.

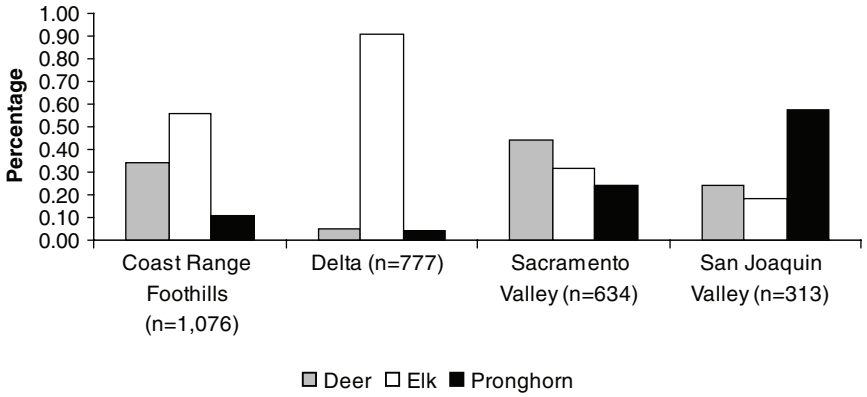


Figure 28. Distribution of Artiodactyl Bone by Habitat in Late Holocene Sites in Central California.

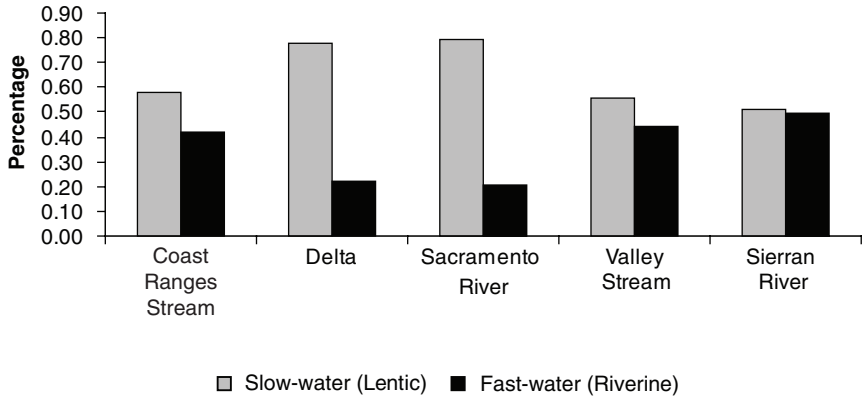


Figure 29. Distribution of Slow- and Fast-water Fishes by Habitat in Late Holocene Sites in Central California.

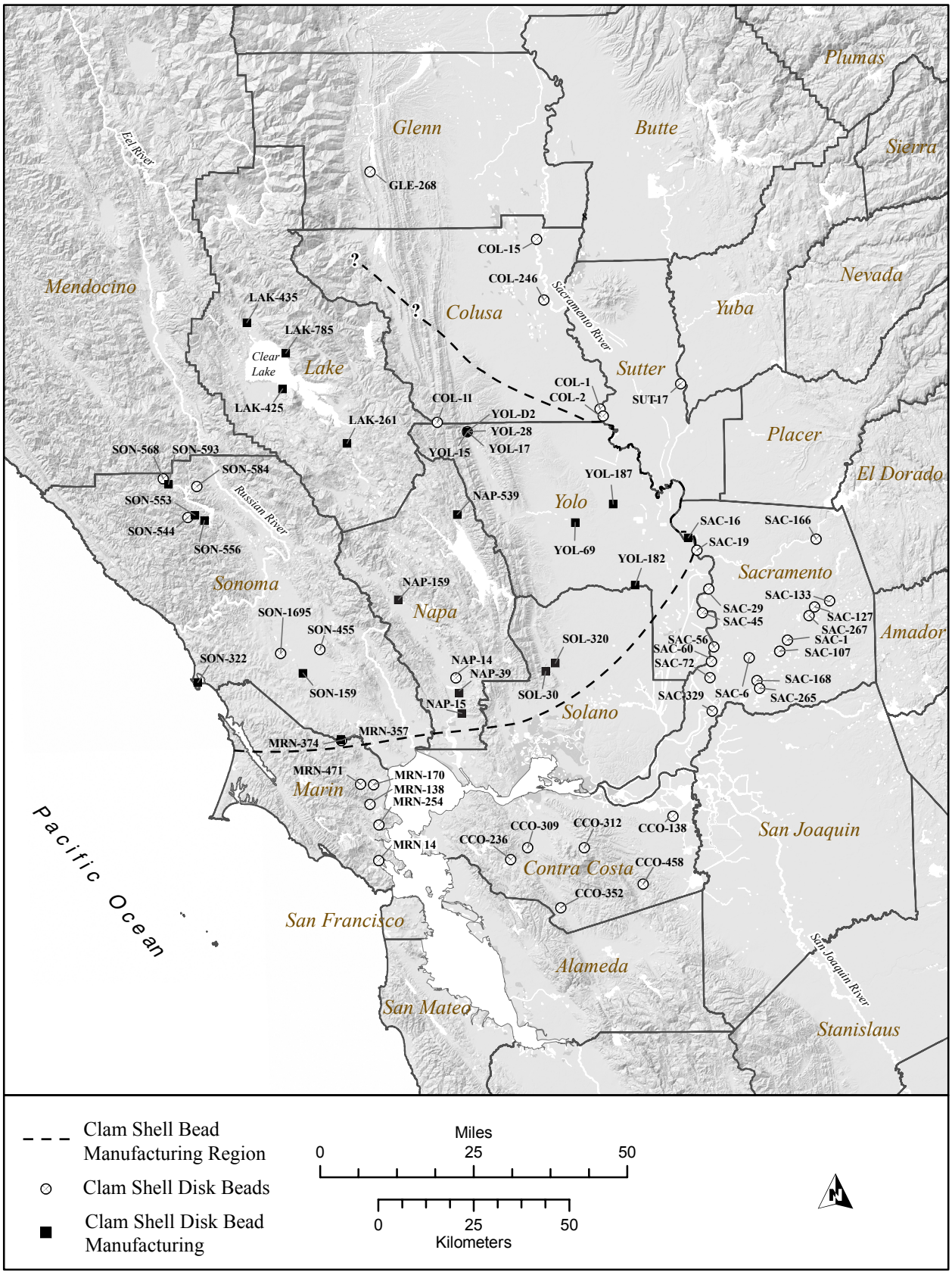


Figure 30. Late Prehistoric Sites in Central California with Clam Shell Disk Beads and Evidence of Bead Manufacture.

particularly at sources east of the Sierra Nevada (e.g., King and Hildebrandt 2006). In response, raw obsidian cobbles and large flake blanks were moved out of the Napa Valley to consumers in the lower Sacramento Valley.

Despite changes in production during the late Holocene, strongly demarcated cultural interaction spheres are evident in the distribution of these different obsidian sources which cannot be accounted for simply by distance to a particular quarry (King and Hildebrandt 2006). This is illustrated by the abundances of different eastern and western obsidian sources in late Holocene sites across the District 3 study area (Figure 31 through Figure 35). In sites on the eastern slope of North Coast Ranges, material originating from Borax Lake in the Clear Lake basin is abundant from the border of Glenn County on the north, to Cache Creek on the south, and extending eastward into the valley as far as the lower foothills of the Sierra (Figure 31). South of Cache Creek, Napa Valley obsidian is the most abundant material stretching from the Coast Ranges in a broad swath across the Delta region and north into the Sacramento valley (Figure 32). It also makes up a significant proportion of the natural glass found along the lower foothills of the western Sierra as far north as the Middle fork of the Yuba River (Figure 32). On the western slope of the Sierra, Bodie Hills obsidian is the dominant material in the watershed of the Middle and South forks of the American River (Figure 33); however, to the north, obsidian originating from quarries in northeastern California makes up a large proportion of the imported glass (Figure 34). Bodie Hills glass occurs in appreciable amounts in the lower foothills of the Sierra, but it makes up only insignificant proportions of obsidian from sites in the Delta region and lower Sacramento Valley (Figure 33). These patterns suggest that a social boundary probably existed in the lower foothills of the Sierra through much of the late Holocene. A poorly demarcated east and west boundary between the distribution of Napa and Borax Lake obsidian in the Sacramento Valley may represent a more permeable division or, more likely, fluctuations over time in social boundaries.

SUMMARY

The environment of central California has changed dramatically since humans first settled the region, some 12,000 to 13,500 years ago. Cooler drier climates of the late Pleistocene gave way to the generally warmer and more variable climate of the Holocene. Shortly after humans arrived in California, numerous genera of mammals and birds went extinct. At the same time, a prominent reorganization of California's plant and animal communities occurred resulting in new combinations of species and significantly altered geographic distributions. Humans quickly took advantage of new habitats, ranging from the open forests and meadows of the mid- and high-elevation Sierra to riparian ecotones along major waterways in the Central Valley and draining the adjacent foothills. Archaeological remains from the early and middle Holocene are rare in the current study area, but reveal the importance of nut crops and other plant foods associated with upland habitats. As early as the middle Holocene, residentially stable communities emerged in the lowland valleys around productive marsh and riparian habitats, while people occupying the foothills and higher elevations in the Sierra continued a pattern of seasonal transhumance, effectively exploiting the peculiar elevational variability in timing and distribution of important animal and plant resources. During the late Holocene, socio-cultural variability increased against a backdrop of generally wetter climatic conditions. Important changes in human land use, socio-political organization, technology, and economic pursuits are evident during this time, perhaps in part affected by significant droughts which periodically enveloped the region.

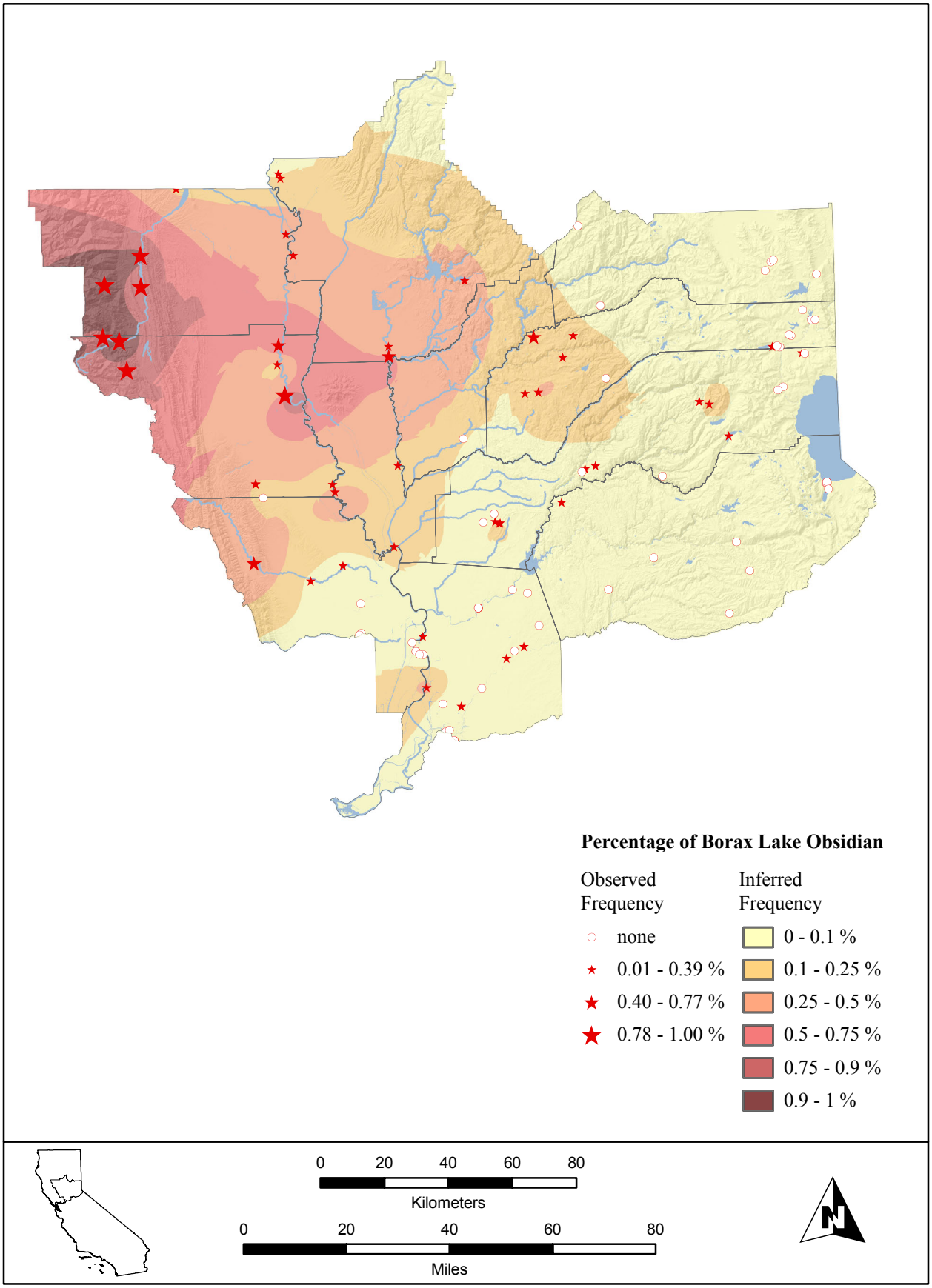


Figure 31. Distribution of Borax Lake Obsidian in District 3 (includes some Mt. Konocti).

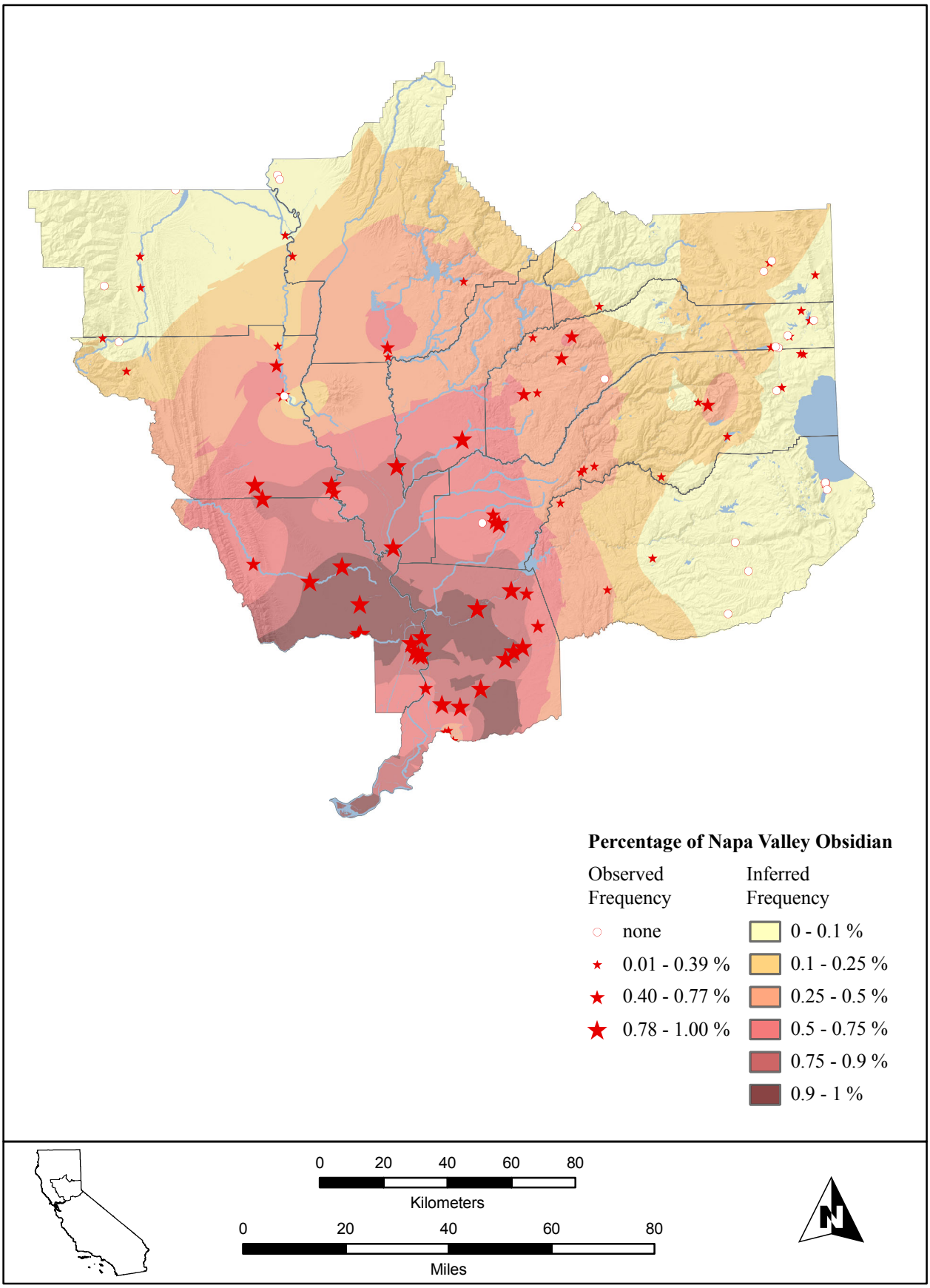


Figure 32. Distribution of Napa Valley Obsidian in District 3.

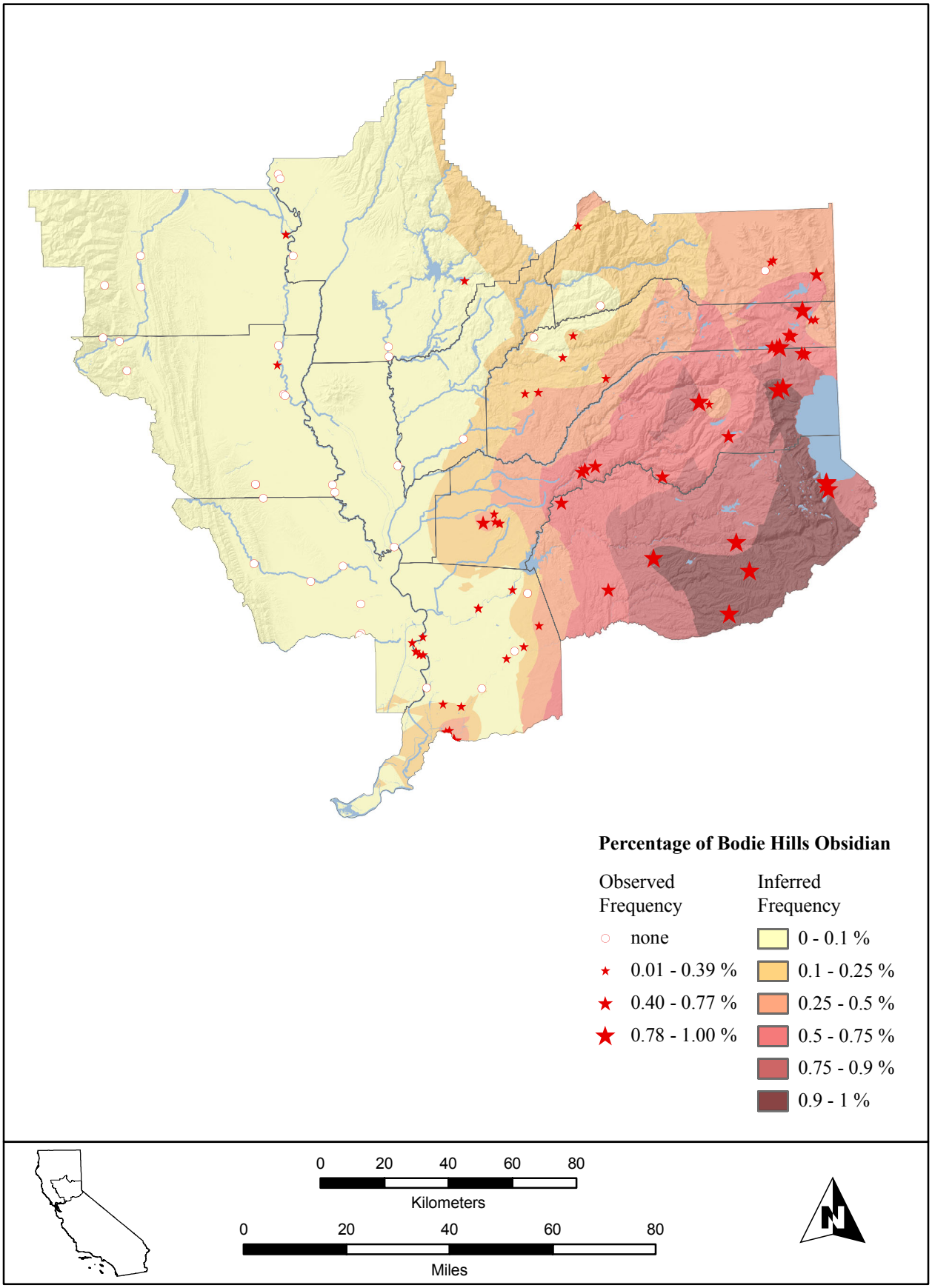


Figure 33. Distribution of Bodie Hills Obsidian in District 3 (includes some Mt. Hicks).

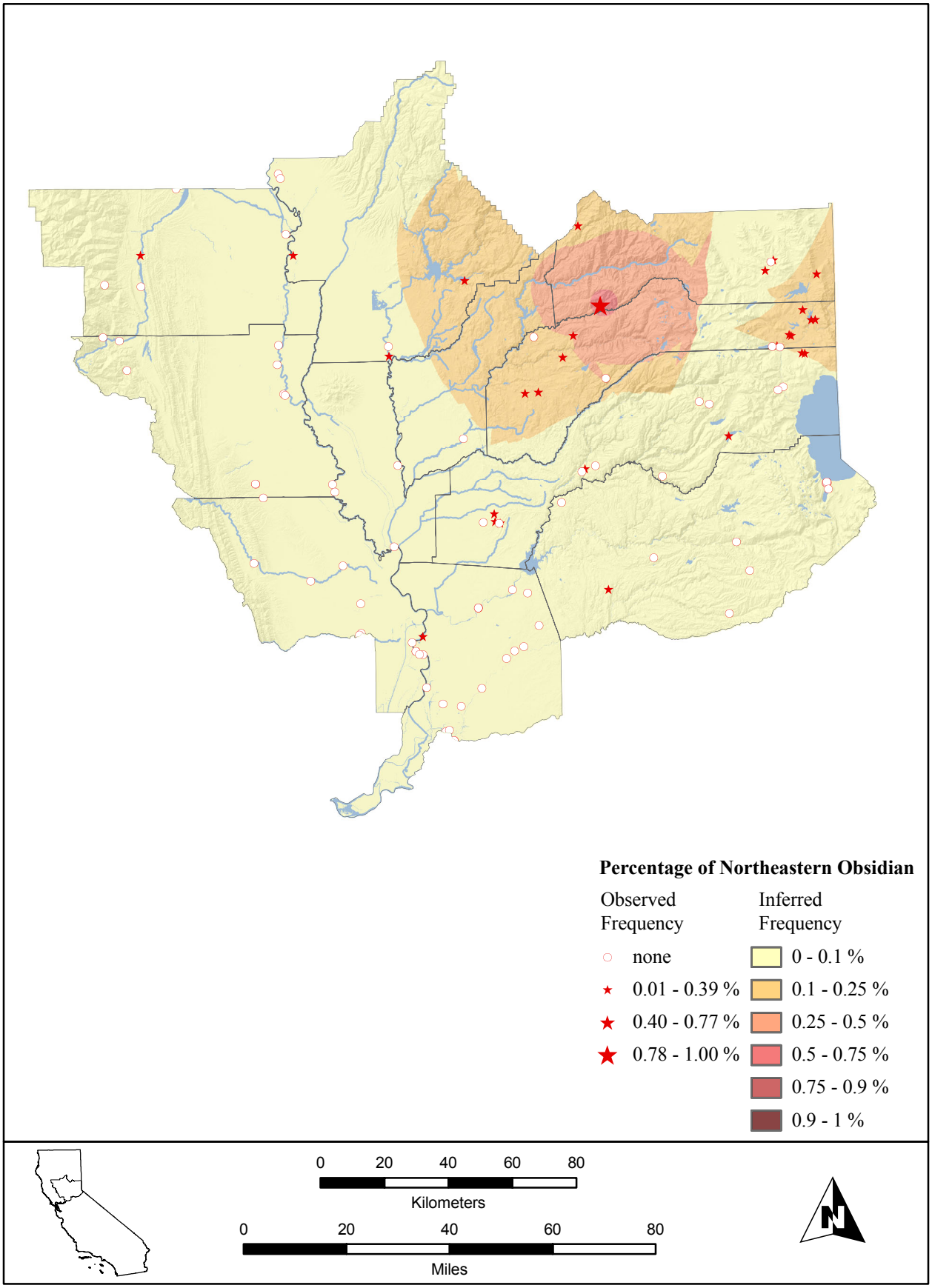


Figure 34. Distribution of Northeastern California Obsidian in District 3.

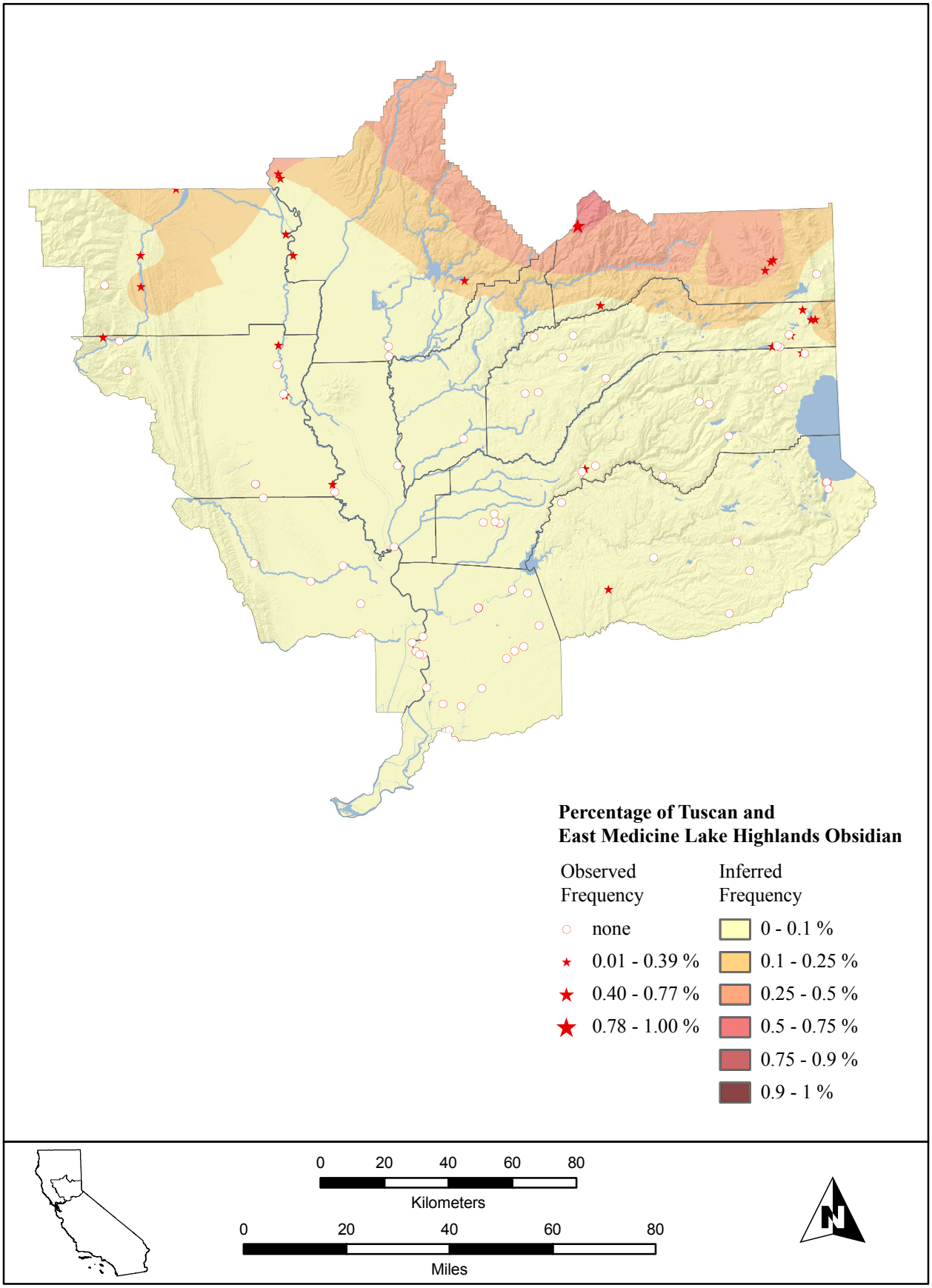


Figure 35. Distribution of Tuscan and East Medicine Lake Highlands Obsidian in District 3.

CHAPTER 3: LATE QUATERNARY STRATIGRAPHIC SEQUENCE

Despite the evidence of region-wide landscape evolution during the latest Pleistocene and Holocene, the nature, extent, and timing of these changes are only vaguely understood in District 3. This is largely because our understanding of the late Quaternary stratigraphic record comes mainly from studies conducted in the San Joaquin Valley and west-central Sierra Nevada foothills outside of District 3. With this limitation in mind, the following section summarizes and describes the age, nature, and extent of major stratigraphic units as defined by the most formative stratigraphic studies. The data and arguments used to construct the prevailing chrono-stratigraphic sequence are critically examined, and the problem of defining stratigraphic boundaries for Pleistocene-Holocene and sub-Holocene units is considered.

This section raises specific doubts about the actual age of landforms identified as belonging to the upper Modesto and post-Modesto formations, and discusses how the application of relative-dating techniques by previous researchers has resulted in age assignments that are inconsistent or completely inaccurate. An apparent gap in the Holocene stratigraphic record is also examined and placed in a regional context. Finally, the section as a whole demonstrates why greater temporal resolution of the stratigraphic sequence is an important archaeological research issue in District 3.

SUMMARY OF PREVIOUS WORK

It is often difficult to identify and correlate individual strata across large geographic regions. What is known about the late Quaternary stratigraphy of District 3 is derived from studies conducted elsewhere in California, so it is useful to understand how the previous studies contributed to the formulation of the existing stratigraphic sequence. The location and historical development of these studies are summarized below.

Central Valley Studies

Though multiple late Quaternary-age alluvial fan, floodplain, and terrace deposits have long been recognized in the Central Valley (Bryan 19 23; Hinds 1952; Lindgren 1911; Piper et al. 1939), Arkley (1954, 1962) was among the first to study and describe specific late Quaternary alluvial sequences in the eastern San Joaquin Valley. The presence of buried soils in the valley and their importance for subdividing stratigraphic units and inferring depositional histories were noted relatively early by Davis and Hall (1958) and Arkley (1965). Based on work in Merced and Stanislaus counties, Davis and Hall (1959) formally identified and described two main Pleistocene-age units, known as the Riverbank (older) and the Modesto (younger) formations. This nomenclature was quickly adopted by others and applied to similar terrace sequences elsewhere in the Central Valley, including the Chowchilla River (Helley 1966), American River (Shlemon 1967), Feather River (Busacca 1982), and larger Sacramento Valley (Blake et al. 1992; Harwood et al. 1981; Helley and Harwood 1985).

In the northeastern San Joaquin Valley, Janda and Croft (1967) recognized a stratigraphic sequence of soils formed on Quaternary alluvium, and correlated it with the glacial history of the Sierra Nevada. Similarly, Atwater (1980) attempted to correlate late Quaternary geological records between the Mokelumne River fan, the Sacramento-San Joaquin Delta, and the San Francisco Bay (also see Atwater and Belknap 1980). Atwater (1982) later produced detailed maps of the late Quaternary deposits for the entire Delta region, including portions of District 3. Building upon these studies, Marchand and Allwardt (1981) went on to subdivide Holocene alluvium into four units, collectively known as the post-Modesto Formation, and to create detailed late Quaternary maps for parts of the northeast San Joaquin Valley. The chronologic sequence of these formations was further refined by Harden (1987) based on an extensive analysis of soils formed in granitic alluvium near Merced. Though examined in less detail, late Quaternary deposits in the northern and western parts of the San Joaquin Valley were studied and mapped by Bartow et al. (1985), Herd (1979), Lettis (1982, 1985, 1988), Noller et al. (1993), Sowers et al. (1993a, 1993b), and Richesin (1996). Along the valley's west side, Lettis (1982) identified a set of Holocene-age fan segments (upper San Luis Ranch, Patterson, and Dos Palos alluvium) that differ from the post-Modesto Formation on the valley's east side.

Geomorphic relationships between soils and landforms of different ages were documented in various parts of District 3 by many of the early soil surveys (Carpenter et al. 1930; Cole et al. 1941; Cosby 1941; Harradine 1948; Holmes and Eckmann 1910; Storie and Trussel 1927; Watson and Hammond 1918; Watson et al. 1925; Weir 1950). Early water studies also generated information about the region's Late Quaternary deposits, such as Bryan (1923), Division of Water Resources (1955), and Thomasson et al. (1960) to name a few. Olmstead and Davis (1961) were among the first to map a series of distinct Pleistocene-age and Holocene-age geologic units throughout the entire Sacramento Valley. While they tentatively correlated some units with those in the San Joaquin Valley (Dupre et al. 1991), they followed Piper et al. (1939) and grouped all Pleistocene-age formations into the Victor Formation, a term and concept that have since been abandoned (Marchand and Allwardt 1981). They also identified and mapped some latest Pleistocene to early Holocene alluvial fan deposits, as well as the recent (i.e., Holocene) river and flood-basin deposits that cover much of the Sacramento Valley. Their analysis of numerous well logs also afforded an initial glimpse into the subsurface stratigraphy underlying the valley floor (see Figure 5).

Shlemon (1967, 1972) was the first to map terraces along the American and Cosumnes drainages and correlate them with the Riverbank and Modesto formations of the northeastern San Joaquin Valley. He also applied these formational concepts to deposits along the Mokelumne River and in the Delta region (Shlemon 1971). In Yolo County, Shlemon and Begg (1972) identified and radiocarbon-dated soils buried in the Putah Creek fan, and linked the soil-chronology to Holocene climatic changes in the Sacramento Valley. Shlemon and Begg (1975) also studied the late Quaternary evolution of the Sacramento-San Joaquin Delta based on stratigraphic and radiocarbon evidence from about 20 subsurface cores. Steele (1979) used soil and landform relationships to help distinguish and map a chronological sequence of Quaternary-age stream terraces in the northwestern Sacramento Valley, including northeastern Glenn County.

More recently, Busacca et al. (1989) used relative soil development and limited radiocarbon dating to identify and map Riverbank, Modesto, and Holocene landforms along Honcut Creek and nearby portions of the Feather and Yuba rivers in the northeastern part of the Sacramento Valley. Robertson (1987) identified and mapped networks of braided paleochannels in the Llano Seco area, and compared their development with the current meandering channel system of the Sacramento River. A fault and seismic hazards study identified and mapped the Quaternary deposits and terraces along creeks in the lower Coast Range foothills of Glenn and Colusa counties, and identified a Holocene-age depositional sequence using buried soils and several radiocarbon dates (Unruh et al. 2001). A combination of geomorphic, stratigraphic, radiocarbon, and some archaeological evidence was used to reconstruct the nature and timing of paleofloods along segments of the American River as part of a hazard analysis by the Bureau of Reclamation (2002).

Late Quaternary deposits have been mapped at various degrees of resolution in part or all of the Sacramento Valley, with most adopting the Riverbank and Modesto divisions of the Pleistocene. For example, deposits were mapped at a general level in the Delta area by Atwater (1982), in the Sacramento area by Wagner et al. (1987), and in the Chico area by Harwood et al. (1981) and Saucedo and Wagner (1991). Helley and Jaworowski mapped the Corning area, including northeast Glenn County, and Blake et al. (1992) mapped deposits of the Willows area at a higher resolution (1:100,000 scale). Graymer et al. (2002) mapped the southwest corner of the valley at the same scale, but did not recognize the Riverbank or Modesto formations.

The most comprehensive geologic map of late Quaternary deposits in the Sacramento Valley and northern Sierra Foothills was produced by Helley and Harwood (1985), and closely follows the divisions of the Riverbank and Modesto formations into upper and lower members as proposed by Marchand and Allwardt (1981). Helley and Harwood also identified four Holocene-age deposits on the basis of their geomorphic position and depositional environment (i.e., alluvial, overbank, stream channel, and alluvial and overbank undivided), but did not subdivide them according to age.

Sierra Nevada Studies

Though the northern Sierra Nevada has not been studied in as much detail as the Central Valley, useful information was generated by geologic investigations of the foothills fault zone (Biggar et al. 1978; Borchardt et al. 1980; Harden and Marchand 1980), and by geoarchaeological studies in the west-central foothills (Haltenhoff 1984; La Jeunesse and Pryor 1996a, 1996b; Meyer 2003; Meyer and Dalldorf 2004; Meyer et al. 2006; Milliken

et al. 1997; Rosenthal 2006; West and Haynes 1990). At higher elevations on the eastern and western slopes, several studies have focused on issues related to the late Quaternary depositional history and/or stratigraphy (Adam 1967; Anderson et al. 1997; Blank et al. 1996; Edlund 1991; James 2003a, 2003b; Lindström 1990; Wathen 2006). The chronostratigraphic studies of meadow deposits conducted by Wood (1975, 1984) in the central Sierra Nevada are the most authoritative and relevant for understanding meadow development in the northern Sierra Nevada, along with a study of meadow development in Plumas County by Blank et al. (1996).

STRATIGRAPHIC SEQUENCE

The information provided by prior studies for the Central Valley and Sierra Nevada forms the basis of our understanding of the late Quaternary stratigraphic sequence in District 3. The sequence and estimated ages of late Quaternary strata have been identified at a general level in the southern Sacramento Valley and the adjacent Sierra Nevada foothills based on: (1) distinctive composition (i.e., lithology) and stratigraphic superposition; (2) lateral disconformities such as the truncation or incision of one alluvial fill by another; (3) relative elevation in a sequence of geomorphic surfaces; (4) relative degree of erosional dissection or preservation of depositional surfaces; (5) the presence and superposition of paleosols and other unconformities; and (6) different degrees of soil development on similar depositional surfaces (Blake et al. 1992; Busacca et al. 1989; Dupre et al. 1991; Helley and Harwood 1985; Steele 1979). Radiometric dating has been used infrequently to determine the age of particular strata. Because there are substantial differences in the nomenclature and temporal resolution used by geologists to define the stratigraphic sequence of the Central Valley, the general nature and extent of the primary stratigraphic units are summarized below according to major time periods. The evidence and arguments used to support the certain notions of late Quaternary landscape development are critically examined.

Because soil scientists use rather obscure terms to describe and characterize soils, a glossary is provided in Appendix D to aid the reader in understanding some of the descriptions and designations used in the following section.

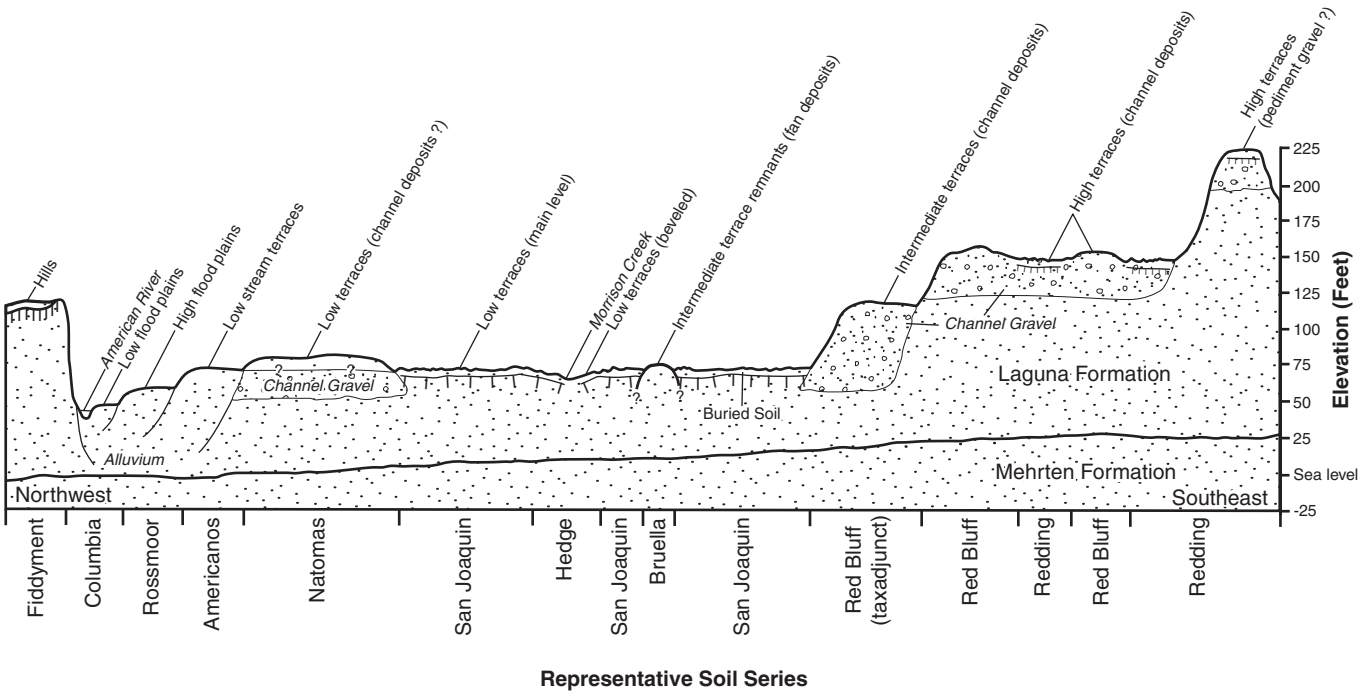
Pleistocene Strata

Early Pleistocene

Early Pleistocene-age deposits consist mainly of highly weathered gravel deposits with bright-red soils that are variously identified as the Arroyo Seco, Laguna, or Red Bluff formations. These deposits form a thin veneer over an older land surface at the northern end of the Sacramento Valley, but generally only occur on high and relatively isolated remnants of older landforms within District 3. Landforms of this age usually have soils that exhibit very well-developed subsurface accumulations of clay (known as an argillic or Bt horizon in soil science) such as those found in the Corning, Redding, and Red Bluff series (Steele 1979). Radiometric dating of the Rockland Ash (above) and the Deer Creek basalt (below) indicate the Red Bluff Formation is between about one million and 450,000 years old. The Red Bluff Formation was tentatively correlated with Auburn deposits in the Sierra foothills (Harden and Marchand 1980:22), with the Arroyo Seco Gravel in the Sacramento area, and possibly with scattered gravel deposits in the Dunnigan Hills and Plainfield Ridge area of Yolo County (Helley and Harwood 1985). These deposits may also be contemporaneous with the Corcoran Clay (Helley and Jaworowski 1985).

Middle Pleistocene: Riverbank Formation

Middle Pleistocene-age deposits consist of relatively coarse-grained alluvium that is generally identified as the Riverbank Formation. Where exposed at the surface, these deposits represent alluvial fans and floodplains that were dissected and truncated by erosion. This alluvium "underlies a prominent, rolling, moderately dissected landscape" (Busacca et al. 1989:19) that is most extensive in the northwestern (Glenn County) and southeastern parts of the Sacramento Valley. These landforms have reddish-colored soils with well-developed argillic (Bt) horizons, as typified by the Bruella, Cometa, Kimball, Natomas, San Joaquin, and Snelling series among others (Figure 36). Near the foothills, Riverbank-age landforms are inset and lie well below older and higher alluvial terraces (i.e., Arroyo Seco, Laguna, Red Bluff formations). Radiometric dating of the Rockland Ash (below) and fossil mammal remains place the age of the Riverbank Formation between about 450,000 and 100,000 years old (Hansen and Begg 1970).



(Note: The vertical scale is exagerated) (Adapted from Tugel 1993:Figure 19)

Figure 36. Idealized Cross-section of the Geomorphic Surfaces, Soils, and Geology South of the American River in Sacramento County.

Upper and lower sub-units (referred to as "members") of the Riverbank Formation in the Sacramento Valley (Blake et al. 1992; Busacca et al. 1989; Helley and Harwood 1985) are correlated with the upper and middle Riverbank units (respectively) in the northeastern San Joaquin Valley (Marchand and Allwardt 1981). Deposits of the upper Riverbank Formation are inset and topographically below those of the lower Riverbank formation. The older sub-unit is also distinguished by surfaces that are more rolling and dissected than the younger. This stratigraphic relationship has resulted in "islands" of the lower formation that are elevated one to five meters above the surrounding land surface of the upper formation (Figure 36). Similarly, many small islands of lower Riverbank occur northwest of the confluence of the American and Sacramento rivers; closer to the confluence, these deposits are partially buried (i.e., surrounded) by Holocene alluvial and basin deposits (Helley and Harwood 1985:11). In the foothills, Harden and Marchand (1980) correlate the middle Riverbank with Bowie Flat deposits, and the upper Riverbank with Oroville deposits (Table 10). Bowie Flat deposits are found at only a few locations in the foothills, while the younger Oroville deposits are more extensive (Biggar et al. 1978:87). As shown in Figure 36, Riverbank and related deposits are often buried by younger alluvium in lower portions of the Sacramento Valley and Delta region (Atwater 1980, 1982; Marchand and Allwardt 1981; Shlemon 1971), and by younger colluvium in the foothills (Harden and Marchand 1980).

Table 10. Correlation of Pleistocene Stratigraphic Units in the Central Valley and Adjoining Foothills.

Area (Reference)	Early Pleistocene >450,000 [a]	Middle Pleistocene ~450,000-130,000	Late Pleistocene ~50,000-30,000	Latest Pleistocene <~30,000
West-Central Sierra Foothills (Harden and Marchand 1980)	Auburn deposits	Oroville (lower) and Bowie Flat (upper)	Wyandotte deposits	Sonora deposits
Eastern San Joaquin Valley (Marchand and Allwardt 1981)	Turlock Lake Formation	Riverbank Formation	Lower Modesto	Upper Modesto
Northern San Joaquin Valley (Atwater 1980, 1982)	None	Riverbank Formation	Lower Modesto	Upper Modesto
Western San Joaquin Valley (Lettis 1982, 1985, 1988)	Tulare Formation	Los Banos alluvium	Lower San Luis Ranch alluvium	Upper San Luis Ranch alluvium
Sacramento Valley (Helley and Harwood 1985)	Red Bluff Formation	Riverbank Formation	Lower Modesto	Upper Modesto

Notes: [a] An Estimated age of the Rockland Ash; the minimum age of the early Pleistocene is placed at 890,000 BP by the International Commission on Stratigraphy.

Late Pleistocene: Modesto Formation and Wyandotte Deposits

As defined by previous studies, the late Pleistocene-age deposits of the Modesto Formation consist of alluvial sediments (gravel, sand, silt, and clay) that form alluvial fans and floodplains. Modesto-age landforms have relatively flat to gently sloping surfaces that are commonly incised by modern stream and river channels near the foothills, but otherwise show little evidence of erosional dissection. The deposits are inset and topographically below the surface of the Riverbank Formation in positions near the foothills and are often covered by younger alluvial sediments near the valley floor (see Figure 5). They are generally mapped near existing stream and river channels across much of the Sacramento Valley floor (Busacca 1982; Helley and Harwood 1985), but "Modesto-age" channels are likely buried in some alluvial fans along the valleys eastern side (Atwater 1980:Figure 34; Busacca et al. 1989:18; Shlemon 1971:434-435). Some isolated deposits of wind-blown (eolian) dune sand, that may be Modesto in age, occur in the Delta (see "Piper sand" of Cosby 1941) and along the southeastern edge of the Sacramento Valley (Atwater 1980, 1982).

Where covered by younger alluvium, the top of the lower Modesto unit forms a laterally extensive buried soil that marks "a significant period of weathering and non-deposition" (Marchand and Allwardt 1981:55). Within District 3, soils formed in lower Modesto deposits are described as having an argillic Bt-horizon, while soils formed in upper Modesto deposits are said to lack argillic horizons (Blake et al. 1992; Helley and Harwood 1985). However, changes in soil color and structure and/or weakly developed argillic horizons (known as a cambic or Bw-horizon in soil science) have also been noted in some soils associated with the upper sub-unit (Busacca et al. 1989:18-19). In the San Joaquin Valley, upper Modesto deposits create a sequence of as many as

four fans or terraces along each of the major (glaciated) Sierra rivers, which "represent four erosional or depositional phases" (Marchand and Allwardt 1981:59). Within the smaller, unglaciated watersheds of the Sierra foothills, however, the upper Modesto forms a single terrace (Marchand and Allwardt 1981:59). In the foothills, Modesto deposits are often buried by Holocene-age colluvial fans (Harden and Marchand 1980), and in the lower portions of the Sacramento Valley and Delta region they are covered by Holocene-age alluvial and tidal deposits (Atwater 1980, 1982; Marchand and Allwardt 1981; Shlemon 1971).

The Modesto Formation is subdivided into upper and lower sub-units whose ages are only partly constrained by stratigraphic and radiocarbon evidence obtained solely from the San Joaquin Valley (Busacca et al. 1989:12). The age of the lower sub-unit was initially estimated to be approximately 40,000 to 30,000 years old (late Pleistocene), and the age of the upper sub-unit about 30,000 to 9,000 years old (Harden 1987; Helley and Harwood 1985; Marchand and Allwardt 1981). The age of lower Modesto deposits was later revised to about 33,000 to 26,000 years old, and upper Modesto deposits to about 26,000 to 11,500 years old based on evidence from the Kings River fan (Atwater et al. 1986). While the deposition of both sub-units is thought to correlate with the major cycles of glaciation (i.e., Tahoe and Tioga) in the Sierra (Atwater et al. 1986; Busacca et al. 1989; Helley and Harwood 1985:10; Marchand 1977; Shlemon 1967, 1971), the temporal relationship has not been demonstrated. Instead, it has generally been presumed that deposition of these units must correspond with glacial cycles, even though the exact age of deposition is not known or well constrained.

In the Sierra foothills, the lower Modesto Formation was tentatively correlated with the Wyandotte deposits, and the upper Modesto with the Sonora deposits (Figure 37). The Wyandotte deposits "normally occur as buried remnants beneath Sonora colluvium," but also form dissected terraces at a few locations in the foothills (Harden and Marchand 1980:5-6). The overlying Sonora deposits are "the most widespread colluvial and alluvial deposit in the foothills" (Harden and Marchand 1980:4-5). Sonora colluvium and alluvium often interfinger at the back edge of stream terraces in larger drainages. These terraces are commonly incised by modern channel cutting. The Wyandotte soils have strongly developed argillic Bt-horizons as opposed to the Sonora soils that have only weak argillic horizons (i.e., Bw or cambic). An early Holocene date of 10,300 cal BP, from the base of alluvium in Placer County, has been cited as a minimum age for the Wyandotte deposits, and a maximum date for the overlying Sonora deposits (Borchardt et al. 1980; Harden and Marchand 1980:5), thus placing the Sonora deposits in the Holocene.

While the age of the Modesto deposits in the foothills of the Sierra Nevada was initially estimated based on relative indicators (e.g., cross cutting, soil development) and a few radiocarbon dates, the chronostratigraphy has since been reevaluated by geoarchaeological studies using archaeological, stratigraphic, and radiocarbon evidence (Meyer and Dalldorf 2004; Meyer in Rosenthal et al. 2006). These studies found that buried soils with argillic Bt-horizons at archaeological sites in the Sierra foothills, similar to the Wyandotte deposits, have produced radiocarbon dates of 10,720 to 9480 cal BP (La Jeunesse and Pryor 1996a, 1996b; Milliken et al. 1997; Peak and Crew 1990). At higher elevations, similar dates (11,120 and 10,935 cal BP) were obtained from rooted tree stumps buried in several upper Sierra meadows (Wood 1975), and a cultural deposit and soil (11,225 to 10,195 cal BP) buried in Gabbott Meadow, Alpine County (Peak and Neuenschwander 1991), indicating that the associated strata correlate in time with the Wyandotte deposits. Chronostratigraphic evidence from the Sonora area places the age of buried soils formed on Wyandotte deposits between 12,240 and 7570 cal BP, and the age of buried soils formed on Sonora deposits between 7500 and 4500 cal BP (Meyer and Dalldorf 2004:71). As shown in Figure 37, this evidence supports a latest Pleistocene age for the Wyandotte deposits and a middle Holocene age for the Sonora deposits. The correspondence in age of buried soils across the western slope indicates that widespread colluvial deposition occurred in the upper and lower portions of the Sierra Nevada during the earliest Holocene, perhaps in response to the transition from Pleistocene to Holocene climatic conditions.

The Pleistocene-Holocene Boundary

The lack of a well-defined and consistently recognizable stratigraphic boundary between Pleistocene-age and Holocene-age geological deposits is both a geological and an archaeological problem. The problem was in part "created" by changing ideas about what constitutes the Pleistocene and Holocene boundary, and partly by innovations and refinements in the way time is calculated and measured (e.g., radiocarbon dating and

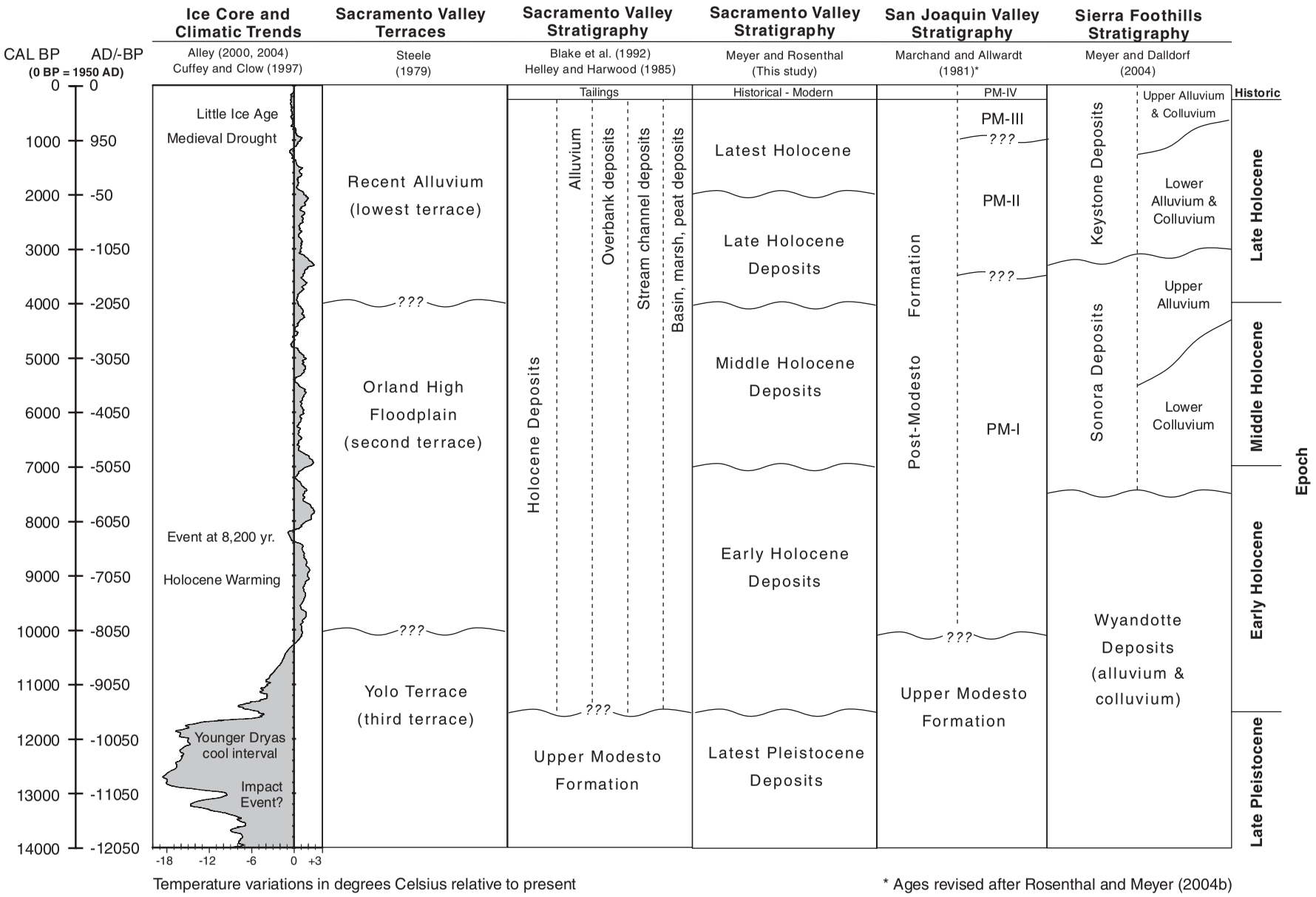


Figure 37. Correlation of Regional Stratigraphic Sequences with World Wide Climatic Trends.

calibration). The Pleistocene-Holocene boundary has traditionally been placed at about 10,000 years ago based on uncalibrated radiocarbon dates, which corresponds to a calibrated, calendar (solar) age at about 11,500 cal BP. It is widely accepted that this date marks the end of the cooler latest Pleistocene conditions (i.e., Younger Dryas), and the start of the warmer conditions that typify the Holocene. A date of 11,653 cal BP has recently been proposed for the Pleistocene-Holocene boundary by the International Commission on Stratigraphy (2006) based on high-resolution evidence from the Greenland ice core project.

Besides time-keeping issues, there are inherent problems with models that seek to connect the timing of large-scale landscape changes solely with glacial-interglacial cycles. As noted above, most models view sediment deposition (glacial outwash) as a byproduct of deglaciation, and usually associate land stability, soil formation, and channel incision with interglacial periods (Arkley 1962; Atwater 1980; Atwater and Belknap 1980; Busacca 1982; Busacca et al. 1989; Marchand and Allwardt 1981; Olmstead and Davis 1961; Shlemon 1967, 1972). There have been few attempts, however, to actually demonstrate that glacial-interglacial periods in the Sierra correlate with the age of the alluvial deposits presumed to derive from these cycles. Until such a correlation is made, existing models are logically circular. The following section provides a critical review of the temporal evidence for the Modesto and post-Modesto formations, which by definition, should represent the Pleistocene-Holocene stratigraphic boundary.

Modesto and Post-Modesto Ages

While the stratigraphic relationship of the Modesto and post-Modesto formations represent an observable physical boundary, the temporal division between the two formations is not well defined. As shown in Table 11, the age of the lower Modesto Formation is the most ambiguous, with estimated maximum ages that vary by 67,000 years and minimum ages that vary by 18,500 years. The amount of uncertainty (age overlap) between the age of these geological formations ranges from 18,500 years for the boundary of the lower and upper Modesto, to 5,200 years for the Modesto and post-Modesto formations (i.e., Pleistocene-Holocene boundary). While the amount of uncertainty in these estimates is small on a geologic time-scale, it is unacceptably large for understanding change on human and archaeological time-scales.

Table 11. Summary of Proposed Pleistocene and Holocene Age Ranges.

Area (Reference)	Lower Modesto	Upper Modesto	Post-Modesto
Sierra Foothills (Harden and Marchand 1980)	>11.5 ka	11.5-7.8 ka	7.8-0 ka
Sacramento Valley (Busacca et al. 1989)	~100-16.7 ka	16.7-9.2 ka	9.2-0 ka
San Joaquin Valley (Harden 1987)	~70-20 ka	~28-9.2 ka	9.2-0 ka
San Joaquin Valley (Marchand and Allwardt 1981)	~40-30 ka	16.7-10.2 ka	10.2-0 ka
Sacramento Valley (Steele 1979)	~80-30 ka	~30-11.5 ka	11.5-0 ka
San Joaquin Valley (Atwater et al. 1986)	~33-26 ka	~26-11.5 ka	11.5-0 ka
Maximum Combined Age Range	~100-11.5 ka	~30-7.8 ka	11.5-7.8 ka

Notes: ka – Kiloannum (1,000 years). Estimates based on radiocarbon dates less than 20 ka are shown as the calibrated intercept (median probability); those older than 20 ka are not calibrated.

As pointed out, sediment deposition in the Central Valley has generally been equated with environmental changes related to the transition from glacial to interglacial conditions. For example, Shlemon (1972) proposed a five-stage model of landscape evolution in the American River drainage that associates interglacial periods with landscape stability and soil formation, and transitions from latest glacial to earliest interglacial with widespread deposition. Another model based on stratigraphic studies of San Joaquin Valley alluvial fan sequences proposes that sedimentation reached maximum levels during glacial retreats, while glacial and interglacial periods are characterized by little sedimentation, channel incision, and soil formation (Weissmann et al. 2002; Weissmann et al. 2005).

If, in either case, these models are correct, then land surfaces throughout the eastern Central Valley and western Sierra foothills dating to the last glacial maximum (i.e., ~20,000 cal BP, Tioga- or lower Modesto-age), should be buried by deposits that date to the glacial-interglacial transition (~18,000 to 11,000 cal BP), that is, upper Modesto in age. However, a high terrace escarpment along the Tuolumne River, mapped by Marchand and Allwardt (1981:60) as upper Modesto Formation, yielded a radiocarbon date of 20,200 cal BP (Beta-185710)

from a well-developed buried soil near its surface (Rosenthal and Meyer 2004b:66-67). The overlying deposit at this location bares a weakly developed (i.e., young) soil profile (Tujunga series) associated with late Holocene-age landforms elsewhere in central California (Rosenthal and Meyer 2004b:66), suggesting that the dated terrace was capped only within last few thousand years. The age of the buried soil on this terrace indicates that upper Modesto deposits, as mapped by Marchand and Allwardt (1981) were emplaced prior to the last glacial maximum (~20,000 cal BP) and would therefore be lower Modesto age. As a result it remains unclear whether there was no deposition associated with the initial glacial-interglacial transition, or that deposition occurred farther down the drainage system. Nevertheless, this lone example indicates that the age of alluvial deposits previously identified as upper Modesto may be substantially under-estimated.

Contrary to the glacial model, studies in the west-central San Joaquin Valley concluded that climatic changes were responsible for the development of alluvial fans and nested terraces along Coast Range drainages—not glaciation (Lettis 1982, 1985). Likewise, glacial cycles cannot explain the formation of similar landforms along the west side of the Sacramento Valley because the northern Coast Range watersheds were almost completely unglaciated (Dupre et al. 1991:174; Steele 1979). Thus, models that attempt to link glaciation with landscape evolution appear to have little direct relevance for the western Sacramento Valley (Dupre et al. 1991:173), and may be flawed at a fundamental level.

Significantly, deposition occurred within many small, unglaciated watersheds that drain the Sierra foothills at about the same time it did within the major glaciated watersheds (Borchardt et al. 1980; Harden and Marchand 1980:8). In the Lodi area for example, crosscutting relations indicate that late Modesto glacial outwash from the Mokelumne River pre-dates alluvium derived from the unglaciated Calaveras River watershed. This led Harden and Marchand to speculate that the late Modesto Calaveras alluvium must be younger than 16,700 cal BP and perhaps even younger than 11,500 cal BP (1980:9), and to alternatively suggest:

> the rise of the forest-oak woodland and oak woodland-grassland boundaries in the western Sierra Nevada during this climatic transition may have exposed weathered bedrock and pre-existing colluvium to active slope processes… the result may have been extensive sheet colluviation in the foothills, overloading of streams, and resultant aggradation and fan alluviation. [Harden and Marchand 1980:10]

This implies that the transition initiated a series of gradual environmental changes that led to widespread deposition in both glaciated and unglaciated drainages. Since the transition spanned about 7,000 years, from about 18,000 to 11,000 cal BP, deposition during the later part of this period could seem to be unconnected and essentially "out-of-phase" with the initial pulse of glacial outwash predicted by the models above. Thus, the transition may have prompted at least two major cycles of deposition, the first due to relatively rapid glacial melting and outwash, and the second due to gradual environmental changes that eventually culminated in widespread deposition. Since late-glacial cooling ended around 11,500 cal BP with the close of the Younger Dryas, environmental changes associated with Holocene warming may have lead to another pulse of deposition in the earliest Holocene. If so, then a recognizable stratigraphic unconformity, such as erosional cuts and/or buried soils, should mark the Pleistocene-Holocene boundary. Alternatively, on-going deposition may have transgressed the boundary, at least in some areas.

In central California, dates from early Holocene-age buried soils form a cluster between 11,200 and 9200 cal BP, with significantly fewer immediately before and after that period (Rosenthal and Meyer 2004b). As shown in Table 11, the dates from these buried soils are generally consistent with the minimum proposed ages for upper Modesto deposits, and the maximum proposed ages for post-Modesto deposits (Harden 1987; Harden and Marchand 1980; Marchand and Allwardt 1981). Thus, the deposition of "upper Modesto" sediment either occurred during the earliest Holocene, or it transgressed the Pleistocene-Holocene boundary.

Soil-Landform Relationships

As noted, researchers have regularly used soil development to determine the relative ages of deposits and geomorphic surfaces in central California. Soils associated with upper Modesto deposits are consistently defined as having weakly developed A/C horizons or clay-rich argillic (Bw or cambic) horizons, while soils formed in lower Modesto deposits generally have strongly developed argillic (Bt) horizons (Marchand and Allwardt 1981:59). Since Marchand and Allwardt formalized this distinction in 1981, it has been adopted as one of the main criteria

for distinguishing and mapping late Pleistocene-age deposits throughout the Central Valley, with little question or study of its relevance, District 3 included (Blake et al. 1992; Busacca et al. 1989; Helley and Harwood 1985). Holocene-age deposits with weak to moderately developed argillic soil horizons have, however, been identified by geoarchaeological studies throughout central California (Meyer 2000; Meyer and Dalldorf 2004; Meyer and Rosenthal 1997; Rosenthal and Meyer 2004a). Because similar degrees of soil development have been documented in both latest Pleistocene and Holocene deposits, the use and application of this relative dating approach is drawn into question, especially for defining the Pleistocene-Holocene boundary.

The following examples illustrate some of the problems of using relative soil development as a dating technique. Along parts of the Merced and Tuolumne rivers, the weakly developed soils of the Hanford series are associated with all four upper Modesto terrace surfaces, which have resulted in a "major problem with the identification and age assignment of subunits" (Harden 1987:5). Deposits of eolian dune sand with weakly developed Delhi and Hilmar soils are also problematic because they locally overlie all four of the upper Modesto fans and terraces, a relationship that suggests they were "deposited during latest Modesto time" (Marchand and Allwardt 1981:58). Although soils of the Fresno series were initially interpreted as being more than 40,000 years old because they have a strongly developed argillic horizon and cemented hardpan (Marchand and Allwardt 1981:56), a date of 31,250 ±325 (USGS-1239) on wood from 20 meters (65.6 feet) below these soils indicates they are significantly younger (Atwater et al. 1986:108). The misinterpreted age of this soil may be related to the fine-grained texture and sodium content of the Fresno soils, which can increase the rate of soil development (Arkley 1964; Jenny 1941:99).

Problematic soil-age relationships are also found in the Sacramento Valley. For instance, in the northwest part of the valley, moderately developed Arbuckle-series soils are recognized on both the lower Modesto and upper Modesto terraces, while weakly developed Cortina and Yolo soils are found on both upper Modesto and post-Modesto terraces (Steele 1979:35). Steele recognized that the soil-terrace age relationships could be inconsistent because the soil profile may have been partly removed by erosion, or misleading because older terraces may be covered by younger deposits with substantially less soil development (1979:34). He observed, for instance, "anomalously young soils on topographically high features," and explained that the source of the younger material was usually "slope wash or alluvial fans" (Steele 1979:37). Thus, extremely old landforms can be covered by a veneer of much younger deposits.

West of the Feather River, a group of "relict distributary channels" located near the town of Gridley appears to have not "carried floodstage flows from the Feather River since early Modesto time" (Busacca et al. 1989:18). Many of these channels still retain topographic features such as natural levees and channel beds even though it is estimated that they were abandoned 20,000 years ago or more (see Table 11). While lower Modesto-age soils should have strong argillic and/or cemented horizons, the soils formed on the beds and levees of these paleochannels have "strong cambic, or weak argillic horizons" (Busacca et al. 1989:18), like those developed on upper Modesto and even some post-Modesto surfaces. Similarly, Robertson (1987) used the presumed ages of soils buried in the paleochannels of the Llano Seco area to suggest that the channels were between 450,000 and 150,000 years old (Riverbank Formation) even though the well-developed soils could have been more deeply buried and exhumed by subsequent channel cutting.

At Honcut Creek along the Butte and Yuba county line, Busacca et al. (1989) identified upper Modesto deposits that have relatively undeveloped surface soils with A/Bw/C profiles (Conejo series). While they bracketed the age of upper Modesto deposition between 11,500 and 9,200 cal BP, they concede that "the age of the surface of the deposit is in the young end of this range of ages" (Busacca et al. 1989:19, 41). Even so, an age of 10,000 BP (i.e., 11,500 cal BP) was adopted, for the upper part of the formation. Contrary to these findings, stratigraphic and radiocarbon evidence from Best Slough in Yuba County indicates that the Conejo-series soils are only late Holocene in age, and probably less than 3000 cal BP (Eidsness and Meyer 1999); see discussions in the following sections.

Though the end of the Pleistocene and start of the Holocene is placed at or near 11,500 cal BP, this temporal boundary is based primarily on climatic and not stratigraphic evidence. The type and timing of environmental changes associated with the glacial-interglacial transition suggest that two major cycles of sediment deposition may have occurred during this interval, and not just one as often suggested. While the exact age of the Modesto and post-Modesto Formations remains a matter of considerable uncertainty and some disagreement,

there is evidence that it is represented in some areas by a stratigraphic unconformity (e.g., erosional cut, soil development, or buried soils), and not by time-transgressive deposition. In either case, additional stratigraphic, radiocarbon, and paleoenvironmental information is needed to understand the sequence of changes that led from glacial to interglacial conditions, and to determine if a stratigraphic boundary can be identified that consistently separates Pleistocene from Holocene deposits in the region.

Holocene Strata: Post-Modesto Formation

Holocene-age deposits consist mainly of fine-grained sediments (sand, silt, and clay) that form basins, fans, and floodplains with largely undissected surfaces. The deposits: (1) are most often located in and near modern drainage systems; (2) are usually inset and topographically below surfaces that are Modesto-age and older near the foothills; and (3) overlie older deposits in and near areas with low topography (see Figure 5). While Holocene deposits occur at locations throughout District 3, they are most extensive on the floor of the Sacramento Valley and Delta region where they have been variously mapped as "alluvial fan and river deposits" (Olmstead and Davis 1961), "recent alluvium and basin deposits (Busacca 1982), or "alluvium, basin, overbank, and stream channel deposits" (Helley and Harwood 1985). In the northeast San Joaquin Valley, Marchand and Allwardt (1981) collectively identified Holocene deposits as the post-Modesto Formation, divided into four temporal subunits (see Figure 37). The age of the post-Modesto Formation and its subunits were initially estimated based on relative-age indicators, such as soil horizon development, supported by a few radiocarbon dates (Harden 1987). The following section describes the Holocene strata using the four-part temporal divisions established for the northeast San Joaquin Valley by Marchand and Allwardt (1981) and modified by Harden (1987).

Early Holocene: Post-Modesto I

As originally defined, early to middle Holocene-age alluvium is represented by post-Modesto I deposits that form low terraces or high floodplains, which are elevated six to eight meters (19.7 to 26.2 feet) above the base of modern rivers or streams (Marchand and Allwardt 1981:61). The limited and somewhat isolated distribution of these deposits on the valley floor suggests they were either "buried or removed by erosion in most places before or during the development of the post-Modesto II terrace-floodplain surface" (Marchand and Allwardt 1981:61). Soils formed on post-Modesto I deposits are said to exhibit weak- to moderately developed profiles with A/AC/Cox/Cn horizons that are often buried by post-Modesto II deposits. These deposits may correspond with other early Holocene deposits in the region, including the Orland High Floodplain in the Stony Creek drainage (Steele 1979), a 10,400-year-old buried soil in the Putah Creek fan at Davis (Shlemon and Begg 1972), and possibly with some buried alluvial and colluvial deposits in the lower Sierra foothills that date between about 11,000 and 7,500 cal BP (Borchardt et al. 1980; Harden and Marchand 1980; Meyer and Dalldorf 2004).

Middle Holocene: An Undefined Stratigraphic Interval

Previous geological studies of the Sacramento Valley and Sierra Nevada have not identified or formally defined a distinct middle Holocene-age deposit in the region; neither buried nor at the surface (e.g., Harden and Marchand 1980; Marchand and Allwardt 1981). Given that sedimentation is thought to have been almost continuous since the late Pliocene in and near the axis of the Central Valley (Busacca et al. 1989: 14; Olmstead and Davis 1961), and that geologic maps have designated some trans-Holocene alluvial units (Blake et al. 1992; Helley and Harwood 1985), the apparent absence of middle Holocene-age deposits is problematic because it suggests this time interval forms a gap in the stratigraphic record. If a middle Holocene stratigraphic unit does not exist, then post-Modesto I deposits could be separated by a temporal gap of at least 3,000 years from post-Modesto II deposits.

In the northwestern Sacramento Valley (see Figure 37), a gap in deposition and terrace formation is implied during the middle Holocene based on the presumed early Holocene-age of the Orland High Floodplain and late Holocene-age of the Recent Alluvium (Steele 1979). The formation and preservation of the Orland High Floodplain appears out-of-sync, however, with the proposed early Holocene incision of the Feather River floodplain that "swept out much, if not all, of the deposits of the upper member of the Modesto" (Busacca et al. 1989:41). At the same time, Busacca et al. (1989) found no evidence of a middle Holocene-age unit in the Honcut Creek area, but instead considered the formation of the Feather River floodplain during late Holocene as

the next, and last, major cycle of Holocene deposition. While early Holocene erosion is invoked to explain the lack of latest Pleistocene deposits, Busacca et al. (1989) do not make a similar claim for the middle Holocene, nor do they offer any explanation for the apparent absence of a middle Holocene stratigraphic unit in the sequence. Once again, if conditions during the middle Holocene were marked by non-deposition and a lack of erosion (i.e., relative land stability), then it should be widely represented by stable landforms that either outcrop at the surface, or are buried in depositional contexts.

Middle Holocene-age deposits have in fact been identified in buried contexts at numerous locations throughout central California (Martin and Meyer 2005; Meyer 1996, 1999; Meyer and Dalldorf 2004; Meyer and Rosenthal 1997; Rosenthal and McGuire 2004; Rosenthal and Meyer 2004a, 2004b; Rosenthal et al. 2006), including North Coast Range floodplains (White et al. 2002), and sand dunes along the Pacific coast (Milliken et al. 1999) and San Francisco peninsula (McIlroy et al. 2001; Meyer in Praetzellis 2004). These deposits are usually represented by buried A-horizons that are underlain at depth by an early Holocene-age buried soil and overlain by late Holocene-age alluvial deposits (Figure 38). In the west-central Sierra foothills, Meyer and Dalldorf (2004) found that middle Holocene-age soils were often buried in fans, footslopes, and floodplains which have weak argillic B-horizons like those described for many upper Modesto-age landforms (Blake et al. 1992; Busacca et al. 1989; Harden and Marchand 1980; Helley and Harwood 1985; Marchand and Allwardt 1981), but are rarely found at the surface. As discussed in *Field Findings and Mapping Results* on page 104, middle Holocene-age buried soils have also been identified at locations throughout District 3, some by this study, and others by previous studies (Elston et al. 1977; Shlemon and Begg 1972; Summit and Pacific Legacy 1999; White 2003a).

Despite the appearance that the middle Holocene interval is missing from the depositional record, a series of radiocarbon-dated stratigraphic sequences from central California provide compelling evidence that it is often represented by soils buried in depositional landforms. Radiocarbon dates from middle Holocene-age buried soils in central California generally cluster between about 6,000 and 5,000 years ago, and occur at depths ranging from less than one meter (3.3 feet) to more than six meters (19.6 feet), with most lying about two to three meters (6.5-9.8 feet) below surface (Rosenthal and Meyer 2004a:27-28). The region-wide extent and consistent ages of these paleosols provide firm evidence that a period of relative landform stability prevailed throughout much of central California during the middle Holocene.

It is equally significant that this stable period was followed by one or more episodes of deposition during the late Holocene that buried a substantial part of the middle Holocene landscape. The overall correspondence between stratigraphic sequences and redundancy of the radiocarbon dates demonstrate that the middle Holocene interval is not missing, but is most often buried with very few surface expressions. It has gone unrecognized or undefined by many previous studies because it is only rarely expressed at the ground surface.

Late Holocene: Post-Modesto II and Lower Keystone Deposits

Post-Modesto II deposits are described as consisting mostly of fine-grained alluvium (sand, silt, and clay) that tend to occur as "distinctive and well-preserved constructional topography of abandoned meander loops and arcuate levees" along the lower reaches of the San Joaquin and major Sierra Nevada rivers (Marchand and Allwardt 1981:64). These deposits form an almost continuous three- to five-meter- (9.8-to-16.5-foot-) high floodplain-terrace along most modern streams and rivers that is typically less than 200 meters (655 feet) wide, but can be more than five kilometers (three miles) wide in some areas. Small post-Modesto II alluvial fans have formed near the point where rivers from the Sierra meet the floodplain of the San Joaquin River. The post-Modesto II terrace was occasionally subject to flooding, erosion, and sediment deposition before modern dams were constructed, particularly in and along active channels. Associated soils are typically shallow with weakly developed (A/Cox/Cn) profiles (Marchand 1977:21; Marchand and Allwardt 1981:63). These soils are "significantly younger" than those associated with post-Modesto I, or upper Modesto deposits, indicating that a substantial difference exists in the age of the two deposits (Marchand and Allwardt 1981:63).

Though the age of post-Modesto II has been estimated to range from as much as 9200 cal BP (Lettis 1982:77) to as little as 2000 cal BP (Marchand and Allwardt 1981:64), it is generally considered to be "late Holocene in age, judging from weak soil development and a few radiocarbon dates" (Marchand and Allwardt 1981:63). Harden (1987:5) cautions, however, that "the PM-II [Post-Modesto II] surface and soil could be

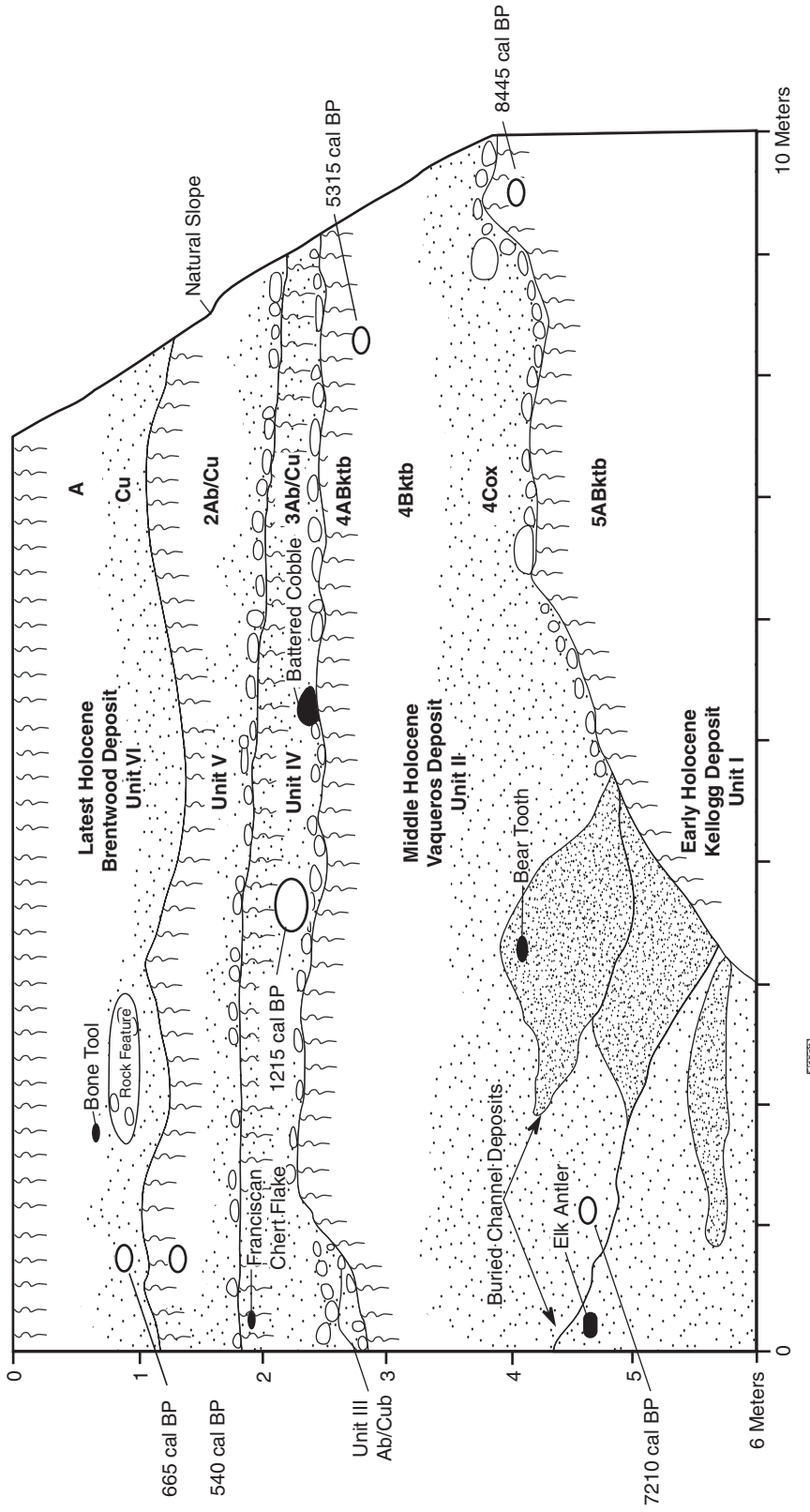


Figure 38. Stratigraphy along Kellogg Creek in the Los Vaqueros Area, Contra Costa County.

younger if covered more recently by flood deposits," underscoring the need for better age constraints. The two radiocarbon dates initially used to define the age of these deposits include a sample dating to about 3200 cal BP (GX-2191) from 1.6 meters (5.2 feet) below the surface of the Feather River terrace-floodplain east of Gridley (Butte County), and another dating to 3625 cal BP (Beta-2788) from 6.2 meters (20.3 feet) below the surface of a post-Modesto III terrace along the San Joaquin River (Harden 1987:5, 8). The late Holocene-age assignment is also supported by six radiocarbon dates that range between 3480 and 1880 cal BP from soils buried by post-Modesto II alluvium in the northeast San Joaquin Valley (Rosenthal and Meyer 2004b).

In the foothills, alluvium and colluvium identified as the Keystone deposit appear to be about the same age as the post-Modesto II deposits. These deposits often overlie the Sonora deposits and make up the current ground surface at many locations, but display very weak (immature) soil profiles with no B-horizons (Harden and Marchand 1980:3-4). Though Keystone deposits may be as much as 4,500 years old (Harden and Marchand 1980:Figure 14), dates ranging from about 3000 and 150 cal BP were obtained from similar deposits in the Sonora area (see Figure 37), which were correlated with post-Modesto II deposits (Meyer and Dalldorf 2004). At higher elevations, some soils, channel deposits, and ash-bearing sediments buried in upper Sierra meadows, and associated peat deposits are temporally correlative with these late Holocene-age deposits (Wood 1975), as are the tidal deposits in the Delta region at lower elevations (Atwater 1980, 1982).

Latest Holocene: Post-Modesto III and Upper Keystone Deposits

As defined in the San Joaquin Valley, post-Modesto III deposits generally consist of fine-grained alluvium (sand, silt, and clay) that fill abandoned channel meanders, form levees and floodplain along modern channels in the valley, or occur as narrow inset terraces along Sierra foothills streams. The soils associated with these deposits display very immature (A/C) profiles (Marchand and Allwardt 1981:64) that appear to correlate with soils with A/Cg profiles formed in poorly drained tidal deposits of the Delta region. The age of these deposits has been estimated to range from a minimum of about 200 cal BP (based on mature oak trees) to a maximum of about 3625 cal BP (Harden 1987:5). However, a date of 1035 cal BP from a sample about four meters (13.1 feet) below the surface of a terrace east of the San Joaquin River suggests these deposits are often less than 1,000 years old (Lettis 1982, 1985).

There is growing evidence that large-scale flooding and deposition occurred throughout much of central-California during the latest Holocene. For example, nearly one-dozen radiocarbon dates constrain the age of surface alluvial and colluvial deposits in the Sierra Nevada foothills between about 1400 and 150 cal BP (see upper Keystone deposits of Meyer and Dalldorf 2004). In District 3, radiocarbon-dated sediments along the South Fork American River indicate that large floods occurred during the latest Holocene (1125-650 cal BP) and buried many older land surfaces (soils) and archaeological sites (Bureau of Reclamation 2002:34). In the northern Diablo Ranges of Contra Costa County, alluvial and colluvial surface deposits have been dated between about 660 and 250 cal BP (see Brentwood unit of Meyer and Rosenthal 1997:34-35). Similarly, more than one-half of the natural surface deposits dated in District 3 are between about 800 and 300 cal BP in age (see *Field Findings and Mapping Results* on page 104). This evidence generally brackets the age of post-Modesto III deposits between 1500 and 150 cal BP.

Historical and Recent: Post-Modesto IV and Artificial Deposits

Post-Modesto IV alluvial deposits form active channels and point bars in modern streams and rivers, and thin veneers of sediment that occur locally on some floodplains. These deposits are still accumulating in poorly drained areas such as lakes, swamps, marshes, the toes of some alluvial fans, and in parts of the lower Sacramento River and Delta region (Marchand and Allwardt 1981:63, 65). Because they have not remained stable long enough to develop any soil horizons, these deposits are variously described as alluvial land, mining debris, made-land, riverwash, tailings, or urban land by county soil surveys. These deposits correlate with historical mining sediments, including some upper Keystone deposits in the foothills (Meyer and Dalldorf 2004; Swan et al. 1977), and with artificial deposits such as earthen dams, landfills, dredging piles, highway and railroad embankments, and backdirt from quarries. As defined, post-Modesto IV deposits range in age from 150 years old to the present.

CHAPTER 4: ASSESSING THE AGE OF DEPOSITIONAL LANDFORMS

INTRODUCTION

As the Late Quaternary Stratigraphic Sequence chapter illustrates, fundamental gaps exist in our current understanding of Pleistocene and Holocene landscape evolution in District 3, particularly in the mountainous areas and in the western Sacramento Valley. Most important for this study is the need to improve the temporal resolution within the regional chronostratigraphic sequence. Instead of determining the age of key strata (e.g., Modesto and post-Modesto formations) using radiocarbon or similar techniques, it has typically been estimated using relative-age indicators that are often inconsistent, inaccurate, or both. Because of this, the existence and age of important stratigraphic subdivisions, such as the Pleistocene-Holocene boundary and Holocene-age sub-units (e.g., middle Holocene interval), remain largely unresolved in the region. Since the potential for buried archaeological deposits is fundamentally tied to the age(s) of depositional landforms, the ability to accurately identify the context and location of these deposits requires that the age of these landforms be assessed with greater precision than before. The approach and methods used to assess and map the age of depositional landforms in District 3 are described in the following section.

APPROACH AND METHODOLOGY

The landscape approach adopted by this study requires that landforms with the potential to contain buried archaeological resources be distinguished from those that are too old or too young to store these deposits. This was done by identifying Holocene-age depositional landforms based on a thorough analysis of the region's chronostratigraphy. In addition to increasing the likelihood that potentially buried archaeological resources will be identified, this approach provides a basis for evaluating potential biases in the nature and completeness of the archaeological record. The methodology used by this approach combines archival research, field studies, and radiocarbon analyses with GIS-based data to map the landforms in District 3 based on age, as described below.

Archival and Field Studies

Prior to fieldwork, an intensive archival study was conducted to compile and review information from soil, geologic, and archaeological studies (e.g., maps, documents, and raw data) that were relevant for understanding the age and stratigraphy of District 3's depositional landforms. Existing geologic maps of the valley (e.g., Atwater 1982; Blake et al. 1992; Graymer et al. 2002; Harwood et al. 1981; Helley and Harwood 1985; Helley and Jaworowski 1985; Saucedo and Wagner 1991; Wagner et al. 1987) were examined and compared with soil survey maps to assess the spatial accuracy and temporal correspondence between them. The archival work found that very few studies provided any specific information about the age of the region's latest Quaternary deposits. Further, close comparisons of soil and geologic maps revealed that many of the same deposits have significantly different ages proposed for them. From this review, it was clear that fieldwork would be needed to understand the physical and temporal relationships between major Quaternary-age landforms, and that additional radiocarbon dates were needed to provide some chronologic resolution to the stratigraphic framework.

Fieldwork was performed in portions of the project area for this study between early January and early November 2007. This work was guided by the following objectives: (1) to examine the geomorphic setting of major depositional landforms and associated soil types; (2) to locate natural exposures in major depositional-soil units and document their subsurface stratigraphy; and (3) to obtain radiocarbon samples that may constrain the ages of major depositional-soil units and refine the existing stratigraphic sequence. The fieldwork was also driven by the need to determine if a stratigraphic boundary could be defined between Pleistocene-Holocene deposits.

As part of the fieldwork, portions of major waterways entering the eastern and western sides of the valley were inspected on foot to identify subsurface exposures in different soil series and landform segments. Each of the major glaciated drainages emanating from the Sierra Nevada was checked or examined, including parts of the American, Bear, Cosumnes, Feather, and Yuba rivers, as well as the segments of many small unglaciated drainage

systems (Table 12). This effort proved to be relatively successful, as several drainages provided excellent natural cut-banks that often revealed several meters of subsurface deposits.

The landscape context of several previously recorded archaeological sites (e.g., BUT-288, -1123, GLE-105, -217, SUT-17, YOL-2, and -17), and some sites identified during this study (e.g., Chickahominy, Elk-Hoe, Lamb Valley, Upper Freshwater, and Wyo sites) were also examined in the field. In addition, California Department of Water Resources geologists, Kohl Buer and Bruce Ross, generously led a boat excursion along the Sacramento River between the Ordbend Bridge and the Glenn-Tehama County line, which allowed us to view cutbanks, find sites, and obtain samples that would have been very difficult otherwise.

Table 12. Small Drainages Included in Field Study, by County.

BUTTE	COLUSA	GLENN	SACRAMENTO	SUTTER	YOLO	YUBA
Big Chico Creek	Bear Creek	Grindstone Creek	Arcade Creek	Braggs Canyon	Benjamin Canyon	Honcut Creek
Honcut Creek	Buckeye Creek	North Fork Stony Creek	Crevis Creek		Bird Creek	
Little Chico Creek	Freshwater Creek	Nye Creek	Deer Creek		Cache Creek	
Pine Creek	Salt Creek (2)	Stony Creek	Hadelsville Creek		Chickahominy Slough	
	Sand Creek		Laguna Creek		Cobbey Canyon	
	South Fork Buckeye Creek				Cottonwood Slough	
	Spring Creek				Lamb Valley Slough	
					Oat Creek	
					Putah Creek	
					Salt Creek	
					Smith Creek	
					Willow Slough Bypass	

Stratigraphic Identification and Soil Description

When natural exposures were identified, they were photographed, mapped, and carefully examined for demonstrable stratigraphic unconformities (e.g., cut/fill, buried soils). The sections were briefly described, and in several cases, charcoal or bulk sediment samples were collected from buried soils or other strata if present. Stratigraphic units (strata) were identified on the basis of physical composition, superposition, cut/fill relationships, relative soil development, and/or textural transitions (i.e., upward-fining sequences). In the field, each stratum was assigned a Roman numeral (I, II, III, etc.) beginning with the oldest or lowermost stratum (often bedrock) and ending with the youngest or uppermost. Buried soils (also called paleosols), representing formerly stable ground surfaces, were identified in the field on the basis of color, structure, horizon development, bioturbation, lateral continuity, and the nature of the upper boundary (contact) with the overlying deposit, as described by Birkeland et al. (1991), Holliday (1990), Retallack (1988), and Waters (1992), among others.

The master soil horizons were designated by upper-case letters (A, B, C, or R) and preceded by Arabic numerals (2, 3, etc.) when the horizon was associated with a different stratum (i.e., 2Cu); number 1 is understood but not shown. The upper part of a complete soil profile is usually called the A-horizon, with a B-horizon being the zone of accumulation in the middle of a profile, and the C-horizon representing the relatively unweathered parent material near the base of a profile. In some cases, an R-horizon was used to indicate the presence of relatively unweathered bedrock. Lower-case letters were used to designate subordinate soil horizons as indicated below (Table 13). Combinations of these numbers and letters indicate the important characteristics of each major stratum and soil horizon; they are consistent with those outlined by Birkeland et al. (1991), Schoeneberger et al. (1998), and the USDA Soil Survey Staff (1998).

Radiocarbon Dating and Soil Samples

Radiometric analysis was conducted to establish the age of buried soils in major landforms of the study area. This allowed for a better understanding of the depositional history and provided refined age estimates for key soils and landforms. Fifteen samples of charcoal and bulk soil were collected from 12 separate localities in District 3 and submitted for radiometric assay. These samples originated from landforms suspected of dating to

the Pleistocene-Holocene transition, or from deposits in intermediate landscape positions associated with widely mapped surface soils. Five samples were analyzed in Miami, Florida by Beta Analytic, Inc., and ten samples were analyzed by the National Ocean Sciences Accelerator Mass Spectrometry Facility (NOSAMS) at the Woods Hole Oceanographic Institution in Woods Hole, Massachusetts (Table 14). The dating and calibration results from the samples are provided in Appendix A.

Table 13. Soil Horizon Nomenclature.

DESIGNATION	DESCRIPTION
MASTER HORIZONS	
A	Mineral horizon formed at the surface
B	Mineral Horizon characterized by accumulations of clay, carbonates, silica, or sodium
C	Unaltered or slightly altered subsurface, mineral horizon
R	Consolidated bedrock underlying soil
SELECTED SUBORDINATE HORIZONS	
b	Buried horizon at the described location (not used with C horizons)
g	Gleyed, or anaerobic, horizon
k	Subsurface (illuvial) accumulation of calcium carbonate
n	Subsurface accumulation of exchangeable sodium
p	Zone of artificial fill or disturbance
q	Subsurface accumulation of secondary silica
t	Subsurface accumulation of silicate clay
u	Relatively unweathered parent material
ox	Oxidized parent material

Notes: See Appendix D for additional definitions of soil terms, horizons, and layers.

Table 14. Radiocarbon Dates Obtained from District 3 for this Study.

COUNTY, LOCATION OR SITE	CONTEXT	MATERIAL	DEPTH (CM)	^{14}C BP	^{12}C/^{13}C	CAL BP [a]	2-SIGMA RANGE	AD/-BC	LAB. NO.
GLE, "Elk Hoe" Site	Natural	Charcoal	200-200	205 ± 35	-26.74	181	138-223	1769	OS-63003
YOL, Chickahominy Site	Cultural	Charcoal	110-120	745 ± 25	-24.03	682	664-724	1268	OS-63004
COL, Salt Creek, Arbuckle	Natural	Soil	150-160	2090 ± 35	-25.48	2062	1986-2150	-112	OS-62979
GLE-105	Natural	Soil	140-150	2320 ± 30	-25.94	2342	2306-2363	1950	OS-63100
GLE-105, Near Ordbend	Cultural	Charcoal	70-76	2500 ± 40	-24.42	2582	2454-2739	-632	OS-63002
SAC-26, Discovery Park	Natural	Soil	380-400	2750 ± 40	-24.90	2841	2765-2929	-891	Beta-233075
GLE, Nye Creek	Natural	Soil	130-140	3160 ± 40	-24.70	3389	3325-3465	-1439	Beta-233073
GLE, Ordbend Bridge	Natural	Soil	140-145	3420 ± 30	-25.31	3670	3580-3726	-1720	OS-63002
COL, Upper Freshwater Site	Cultural	Charcoal	195-195	3580 ± 40	-25.20	3883	3818-3983	-1933	Beta-233071
SAC-26, Discovery Park	Natural	Soil	550-580	3680 ± 40	-24.80	4020	3897-4096	-2070	Beta-233074
COL, Salt Canyon	Natural	Soil	310-325	5380 ± 35	-25.03	6200	6173-6282	-4250	OS-62873
SAC, Laguna Creek	Natural	Soil	270-280	5410 ± 40	-25.31	6230	6176-6296	-4280	OS-62983
YOL, Chickahominy	Natural	Soil	300-310	9400 ± 50	-26.45	10631	10507-10747	-8681	OS-63029
YOL, Chickahominy	Natural	Charcoal	800-810	10250 ± 70	-25.11	12000	11745-12244	-10050	OS-62975
GLE-105	Natural	Soil	130-150	11080 ± 60	-24.80	12999	12892-13106	-11049	Beta-233072

Notes: [a] Median probability; all dates from buried soils or buried deposits.

Radiocarbon (^{14}C) is produced primarily by the interaction of cosmic radiation with nitrogen in the earth's atmosphere. After mixing with carbon dioxide, ^{14}C is readily assimilated by plants and other living organisms. When plants and animals die, however, ^{14}C levels start to decrease because new carbon is no longer absorbed. Since ^{14}C is known to decay at a rate that approaches a half-life of 5,730 years, the amount of decay reflects the age of biogenic carbon as compared to modern levels of ^{14}C activity (Geyh and Schleicher 1990). For historical reasons, a half-life of 5,568 years, developed by radiocarbon pioneer Willard Libby, is applied by

international convention, with the "present" held at 1950 AD. Details regarding the methods and techniques used to date the samples are provided in Appendix A.

Soils and sediments can be dated if they contain biogenic carbon in the form of organic matter, or humates (i.e., soil organic matter). The differential decomposition, humification, and translocation of biogenic carbon in a given deposit determine the type and amount of soil organic matter available for dating. The accuracy of soil dates depends on the researcher's ability to select samples that will minimize potential contaminants (Scharpenseel 1979) and to properly interpret the context of the sample (Matthews 1985). The ^{14}C age of a soil or sediment reflects the apparent mean residence time of the total organic content of the analyzed material. Since soil formation is time-transgressive, mean residence time dates are usually younger than the true age of the soil. Understood in this way, the ^{14}C age of a soil does not mark a single time or event, but reflects the influence of multiple processes that affect the soil carbon system over time. Thus, selecting a sample depends on the question at hand. To determine the approximate minimum age of a soil, a sample is collected near the upper portion of a buried A-horizon, whereas, the approximate maximum age can be determined by collecting a sample from deeper in the profile, or from an underlying stratum.

Radiocarbon Database

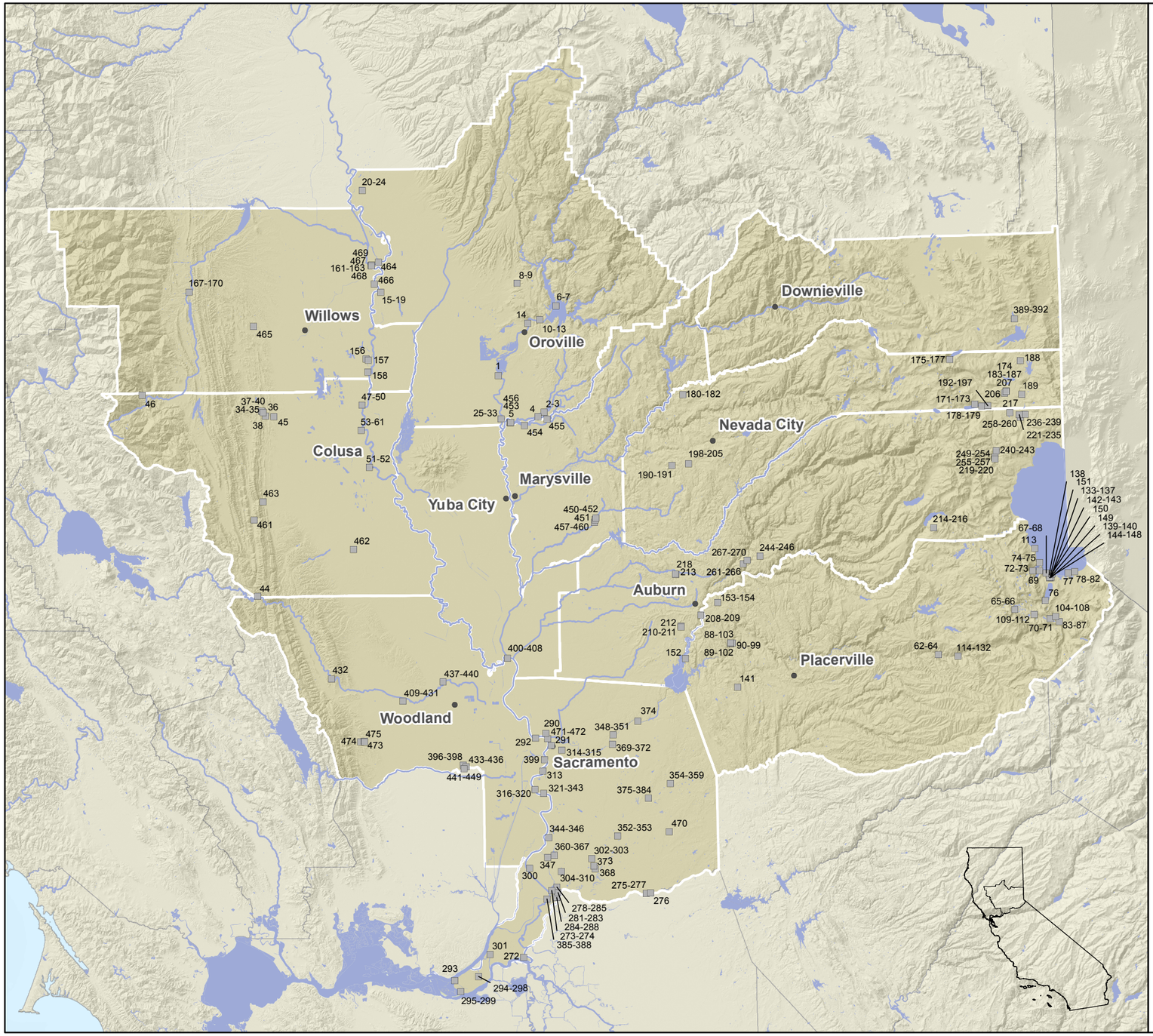
Inclusive of the 15 dates obtained for this study, a radiocarbon database was developed to evaluate the chronological relationships between different landforms, soil types, and archaeological deposits. The database consists of 459 radiocarbon dates obtained from 150 different locations in the study area (Appendix A). Figure 39 shows all the locations where radiocarbon-dated samples have been obtained in District 3.

As shown in Table 15, most (53%) of the dates originated from counties located in the lowlands of the Sacramento Valley, while the rest are from counties that extend over the Sierra Nevada uplands. More than 45% of these are from Sacramento (n=117) and El Dorado (n=93) counties, while dates from Yuba (n=11) and Sierra (n=4) counties account for less than 2.5% of the total; no dates were identified from Sutter County. While the majority (~55%) of dates are from archaeological sites (i.e., cultural contexts), also included were those obtained by geological and paleoenvironmental studies from non-cultural or natural contexts.

Table 15. Radiocarbon Dates by County.

COUNTY	COUNT	PERCENT
Butte	33	7.2
Colusa	28	6.1
El Dorado	93	20.2
Glenn	16	3.5
Nevada	37	8.0
Placer	63	13.7
Sacramento	117	25.4
Sierra	4	0.9
Sutter	0	0.0
Yolo	57	12.4
Yuba	11	2.4
TOTAL	459	100.0

The context of each sample was evaluated based on the available stratigraphic information. A sample was considered buried if it was associated with a depositional stratum that is unrelated to an overlying stratum. Thus, several samples were designated as originating from buried deposits even though they were not deeply buried below the surface, and samples from two sites covered by artificial fill deposits were also designated as buried deposits. In the absence of adequate stratigraphic information or other chronologic indicators, samples collected from depths of 150 centimeters or more were generally presumed to be from buried deposits. Based on the evaluation, 18 dates were excluded from further analyses because they were from suspect contexts or because they were considered anomalous, even by the original researchers.



Map No.	Location	Map No.	Location	Map No.	Location
1	BUT, Gridley	156	GLE, Codora, Four Corners	301	SAC, Twitchell Island
2-3	BUT, Honcut Creek-B	157	GLE, Little Packer Lake	302-303	SAC-006
4	BUT, Honcut Creek-A	158	GLE, North of Princeton	304-310	SAC-021, Hollister
5	BUT, Honcut Creek-C	161-163	GLE-105, Near Orbend-B	313	SAC-029
6-7	BUT-084, Oroville Reservoir	167-170	GLE-217	314-315	SAC-034, Sutter Fort
8-9	BUT-131, Flag Canyon	171-173	NEV, Donner Lake	316-320	SAC-042
10-13	BUT-157, Oroville	174	05-17-57-73	321-343	SAC-043
14	BUT-182, Oroville	175-177	NEV, Independence Lake	344-346	SAC-060
15-19	BUT-233, Llano Seco	178-179	NEV-013/H	347	SAC-065, Dutard
20-24	BUT-294, Wurlitzer Site	180-182	NEV-015, Childers Site	348-351	SAC-099
25-33	BUT-496	183-187	NEV-021	352-353	SAC-107
34-35	COL, Funks Creek-A	188	NEV-120	354-359	SAC-133
36	COL, Funks Creek-D	189	NEV-182/H	360-367	SAC-145
37-40	COL, Funks Creek-B	190-191	NEV-194	368	SAC-151, Need #1
38	COL, Funks Creek-C	192-197	NEV-199	369-372	SAC-157, Wamser #1
44	COL-011, Cache Creek	198-205	NEV-407	373	SAC-168B
45	COL-037	206	NEV-884	374	SAC-205, American River
46	COL-081	207	NEV-884/H	375-384	SAC-267
47-50	COL-158	208-209	PLA, Auburn area-C	385-388	SAC-329, Walnut Grove
51-52	COL-245/H	210-211	PLA, Auburn area-A	389-392	SIE, Sardine Valley
53-61	COL-247	212	PLA, Auburn area-B	396-398	YOL, Davis
62-64	ELD, Alder Creek	213	PLA, Auburn Dam	399	YOL, W. Sacramento
65-66	ELD, Aloha Lake	214-216	PLA, Bunker Lake	400-408	YOL-013
67-68	ELD, Baldwin Beach	217	PLA, FS-05-17-57-209	409-431	YOL-069
69	ELD, Cascade Lake	218	PLA, Orr Creek	432	YOL-110
70-71	ELD, Echo Lake	219-220	PLA, Squaw Valley	433-436	YOL-182
72-73	ELD, Emerald Bay-A	221-235	PLA-005	437-440	YOL-187
74-75	ELD, Emerald Bay-B	236-239	PLA-006	441-449	YOL-197
76	ELD, Fallen Leaf Lake	240-243	PLA-023	450-452	YUB, Best Slough-B
77	ELD, Lake Tahoe-A	244-246	PLA-101	451	YUB, Best Slough-A
78-82	ELD, Lake Tahoe-B	247-248	PLA-163	453	YUB, Honcut Creek-A
83-87	ELD, Meyers Grade Marsh	249-254	PLA-164	454	YUB, Honcut Creek-D
88-103	ELD, Old Rock Bridge-C	255-257	PLA-165	455	YUB, Honcut Creek-B
89-102	ELD, Old Rock Bridge-B	258-260	PLA-272	456	YUB, Honcut Creek-C
90-99	ELD, Old Rock Bridge-A	261-266	PLA-695/H	457-460	YUB-1157
104-108	ELD, Osgood Swamp	267-270	PLA-728/H	461	COL, Salt Canyon
109-112	ELD, Ralston Ridge	272	SAC, Andrus Island	462	COL, Salt Creek, Arbuckle
113	ELD, Rubicon Point	273-274	SAC, Delta Meadows	463	COL, Upper Freshwater Site
114-132	ELD, Sand Flat	275-277	SAC, Dry Creek-A	464	GLE, "Elk Hoe" Site
133-137	ELD, Tallac Point	276	SAC, Dry Creek-B	465	GLE, Nye Creek
138	ELD, Taylor Marsh	278-285	SAC, East of Locke-B	466	GLE, Orbend Bridge
139-140	ELD, Visitor Center Site	281-283	SAC, East of Locke-C	467	GLE-105, Near Orbend-C
141	ELD-044, White Oak Flat	284-288	SAC, East of Locke-A	468	GLE-105, Near Orbend-A
142-143	ELD-179	290	SAC, Natomas, W of I-5	469	GLE-105, Near Orbend-D
144-148	ELD-180	291	SAC, Sacramento	470	SAC, Laguna Creek
149	ELD-184, Tallac Point-C	292	SAC, Sand Cove	471-472	SAC-026, Discovery Park
150	ELD-184, Tallac Point-B	293	SAC, Sherman Island-A	473	YOL, Chickahominy Site
151	ELD-184, Tallac Point-A	294-298	SAC, Sherman Island-B	474	YOL, Chickahominy Slough-A
152	ELD-201	295-299	SAC, Sherman Island-C	475	YOL, Chickahominy Slough-B
153-154	ELD-616/H	300	SAC, Steamboad Landing		

Radiocarbon Sample Locations - see Appendix A (14C database) for additional sample and location information

N

0 10 20 30 40
Miles

0 25 50 75 100
Kilometers

Figure 39. Locations with Radiocarbon-Dated Samples in District 3.

Due to variations in the atmospheric concentration of radioactive carbon over time, each date less than 20,300 ^{14}C BP was calibrated using the CALIB software program (version 4.4) developed by Stuiver and Reimer (1993), hereafter expressed as the median probability in calendar (solar) years before present (cal BP) unless otherwise noted. The median probability (cal BP), the 2-sigma range cal BP, and the mean calendar year (AD/BC) of each sample are provided in the database (Appendix A). One date was excluded from further analysis because it was too young to calibrate (modern), and eight dates older than 15,890 ^{14}C BP (~19,080 cal BP) were excluded because they pre-date a human presence in the region. With 27 samples excluded, the radiocarbon database was comprised of 432 dates used for analysis.

For each date, additional contextual information was recorded on the geomorphic province (e.g., Sacramento Valley, Sierra Foothills, Coast ranges), associated landform, (e.g., floodplain, fan, terrace, basin), type of geologic deposit (e.g., surface deposit, buried soil, buried channel), provenience designation (e.g., excavation unit, core sample number), type or context of the sample (natural or cultural), depth of sample (in centimeters), and material dated (e.g., wood, charcoal, soil organic matter). The laboratory number, any associated ^{12}C/^{13}C measurement, the original reference, and the Universal Transverse Mercator (UTM) coordinates for each sample was also compiled.

Mapping Methods

Since the age of surface deposits in District 3 have not been mapped at a level of detail needed for archaeological applications, we created a map of the depositional landforms based mainly on digital data from the Natural Resource Conservation Service Soil Survey Geographic Database (Natural Resource Conservation Service 2008), which was supplemented by information from existing soil surveys, geologic investigations, and archaeological studies. The soil data occur in two formats, with the most detailed being the Soil Survey Geographic (SSURGO) database, which is a digital duplication of the original soil survey maps. Though designed primarily for natural resource planning and management, the SSURGO-level data was previously used to develop reasonably detailed maps of surface geologic deposits, such as those created for geoarchaeological sensitivity studies elsewhere in the region (Rosenthal and Meyer 2004a, 2004b).

The SSURGO-data cover all eleven counties of District 3, as well as neighboring ones. The combined dataset consists of 11,493 entries associated with 2,539 individual soil polygons and 866 distinct soil series, complexes, or other units, such as quarries or water, with particular attributes assigned to each. The data specific to District 3 were compiled into a single database, reviewed and cross-checked for quality, and coded so that similar soil types and landforms could be consistently sorted and grouped.

Because specific soils types are typically associated with specific depositional environments and landforms of a particular age, soil series were used to define the extent and chronological relationship of landform groups. The degree of soil profile development provided by official soil descriptions and soil surveys were used to make relative age estimates, while the boundaries between the original soil polygons were used to define contacts between temporal groups. Soil series associated with pre-Pleistocene landforms were first identified and segregated from those associated with landforms that appeared to be Pleistocene or Holocene in age. This process was facilitated by the use of published soils surveys, along with previous geological studies.

In addition to relative soil development, decisions about the age of different soil series were also based on the geomorphic position of associated landforms, cross-cutting relationships, degree and extent of erosional dissection, radiocarbon dates, and correlation with other dated deposits. As part of this analysis, it became clear that landforms previously identified by other researchers as either Pleistocene or Holocene in age were often mapped within the same soil series. In these cases we relied on a combination of soil profile development, horizontal cross-cutting relationships, and radiocarbon dating to place similar soil series and landforms into particular temporal groups. Following a long series of detailed comparisons, we identified soil-map units that were consistently associated with landforms that occupy similar geomorphic positions on the landscape. Once identified, these units were coded and grouped into major temporal periods that were then mapped in GIS using the SSURGO shape-files.

Mapping Limitations

It is important to know a little about how the original soil map data were gathered and constructed to understand the limitations of the map itself. First, soil scientists must define the boundaries between soils based on

a limited number of observations even though individual soils often merge gradually into one another across a landscape (Reed 2006:19). At the same time, individual soil polygons often contain some percentage of other soil types that are either too small or too spatially complex to be differentiated at the scale of the soil series map. Thus, a certain amount of acceptable error is built into the soils data. It is also apparent that the agriculturally fertile soils in the Sacramento Valley were mapped in far greater detail than the less fertile soils in the foothills and mountains. Consequently, the spatial resolution of the soils maps is generally better in the lowlands than the uplands.

Because the soils in different counties were mapped by different people using different methods and criteria at different times, it was sometimes difficult or impossible to match comparable soil series and associated age groups across county lines. Matching problems are the most obvious between Butte, Colusa, and Glenn counties (Figure 40). These discrepancies are due in part to the spatial resolution of the individual soil polygons, which were clearly mapped in greater detail in Glenn County by Eugene Begg (1968) than those mapped more recently in Butte and Colusa counties (Burkett and Conlin 2006; Reed 2006). Though similar problems were found along many other county lines, they were relatively minor compared to the Butte-Colusa-Glenn example. Together, these differences may be "the result of soil reclamation, land leveling, and drainage; modifications in the series and map units concepts; or variations in the intensity and scale of mapping or in the extent of the soils in the survey areas" (Reed 2006:20). At the same time, "a better knowledge of soils" may also explain why differences exist between certain areas (Burkett and Conlin 2006:12).

As for the way that buried soils are or are not identified by soil surveys, the current soil taxonomy states that, "a buried soil is covered with a surface mantle of new soil materials that either is 50 centimeters or more thick or is 30 to 50 centimeters thick and has a thickness that equals at least half the total thickness of the named diagnostic horizons that are preserved in the buried soil" (USDA Soil Survey Staff 1998:10). When these criteria are strictly applied, buried soils that are too thin or too shallow are not distinguished as such, but are instead often identified as part of the present A-horizon, or as a B-horizon due to color and structural changes. Thus, the shallow B-horizons identified in some soil types likely represent buried soils that did not meet the criteria, or were not recognized as such.

Finally, we did not attempt to adjust the soil polygon boundaries as originally defined. While the precision of our map unit boundaries could be significantly improved through stereoscopic comparisons of aerial photographs and topographic contours, these methods could not be reasonably employed given the large size of the study area and limited scope of this study. Consequently, all the map unit boundaries should be considered approximate, and the degree of spatial resolution is no better than the level of detail provided by the Soils Database. Because our map units are intended to emphasize temporal differences, and not depositional environments, multiple depositional environments may be represented in any one unit. Even so, some obvious depositional settings (e.g., fans, floodplains, basins, channels and glacial deposits) can be easily recognized from the overall shapes and relative locations of certain map units. The general age, nature, and distribution of these map units are described below. Appendix B includes the soils database which correlates soil series, map units, and buried site potential.

FIELD FINDINGS AND MAPPING RESULTS

The overriding goal of the field and mapping effort was to assess and map the surface soils and associated landforms by time intervals useful for estimating the potential for buried archaeological deposits in different parts of District 3. This was an interactive process where the initial mapping allowed key soil and landform types to be identified that were later field checked, or sometimes radiocarbon-dated, which then led to revisions in the age assignments for certain soil series. In total, nine different landform age-groups were identified and mapped across more than eight million acres (12,648 square miles, or 32,758 square kilometers) of the district; only the city of Orland in Glenn County was not mapped because soils data were not available. The nine mapped age groups include, Pre-Pleistocene, Older Pleistocene, Latest Pleistocene, Early Holocene, Middle Holocene, Late Holocene, Latest Holocene, Historical-Modern, and Historical-Modern Cut/Fill deposits (hereafter referred to as map units); existing bodies of water were depicted as a separate map unit. The area covered by each map unit is summarized in Table 16, and the mapping criteria and field characteristics that define each age-group are described below, from oldest to youngest, including the most common soils series found within each map unit. Radiocarbon dates associated with each map unit are summarized, focusing on those dates which were used to define the age of each

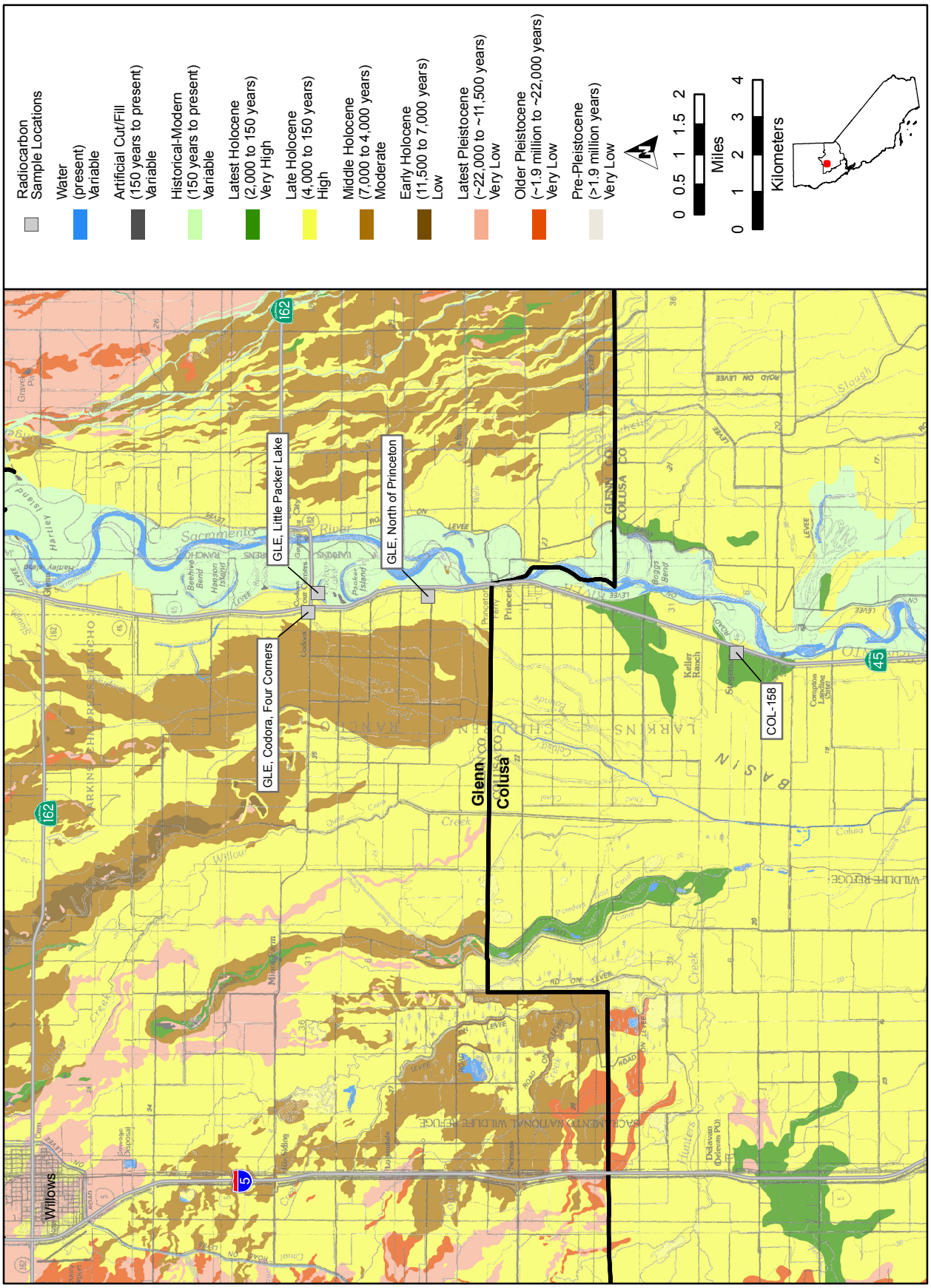


Figure 40. Example of Irreconcilable Discontinuities between Soil-Map Units at the Colusa and Glenn County Border.

Table 16. Spatial Extent of Units Mapped in District 3 for this Study.

Map Unit Age	# of Polygons	Minimum Acres	Maximum Acres	Average Acres	Total Acres	Percent
0 Pre-Pleistocene	1495	0.1	74,000	2,994	4,476,689	55.30
1 Older Pleistocene	217	5.1	55,081	4,117	893,389	11.04
2 Latest Pleistocene	217	1.2	28,332	2,714	588,848	7.27
3 Early Holocene	17	177.3	30,740	5,151	87,568	1.08
4 Middle Holocene	43	1.7	20,971	1,995	85,802	1.06
5 Late Holocene	193	5.4	58,144	4,706	908,262	11.22
6 Latest Holocene	150	20.0	35,708	3,179	476,804	5.89
7 Historical-Modern	131	8.3	23,997	1,907	249,866	3.09
8 Historical-Modern Cut/Fill	58	6.8	16,564	1,993	115,617	1.43
9 Water (H2O)	17	21.6	88,482	12,474	212,055	2.62
Unmapped (City of Orland)	1	608.0	608	n/a	608	0.01
Total	2539	-	-	-	8,095,506	100.00

unit. A wide range of dates was often associated with each map unit; some were from un-related depositional strata below the mapped surface; others only provide minimum ages for a map unit that may be thousands of years older than the oldest associated radiocarbon date.

Map Unit Definitions

Pre-Pleistocene (>1.9 million years)

The Pre-Pleistocene group is composed of all deposits and bedrock formations that range from Paleozoic to Pliocene in age. This group encompasses most of the foothill and mountainous portions of the northern Coast Range, southern Cascades Range, and northern Sierra Nevada (Figure 41), which accounts for more than 4.4 million acres, or 55% of District 3 (Table 16). The age of deposits and formations within the map unit were not differentiated because they are far too old to contain any buried archaeological evidence. The Pre-Pleistocene unit is generally associated with landforms dominated by erosional processes such as bedrock outcrops, hills and ridges, and a few deeply dissected alluvial terraces. These landforms range from level to vertical (0-99%) with an average slope of about 29.5%.

A total of 501 different soil types is associated with these landforms, ranging from very weakly developed Entisols to very well developed Ultisols, with most being Alfisols such as the Sites, Cohasset, Josephine, Millsholm, and Holland series (Appendix B presents a complete list). The 88 radiocarbon dates associated with these landforms range from 10,310 to 77 cal BP, which is obviously less than the unit's maximum age (Table 17). Even so, more than 20 of these dates were derived from buried contexts in the Sierra Nevada, mostly along the South Fork American River, which reflects the over-generalization and limited spatial resolution of the units mapped in the upland areas.

Table 17. Bracketing Radiocarbon Dates and Age Ranges of Map Units.

Map Unit	Maximum cal BP	Minimum cal BP	Map Unit Range
Pre-Pleistocene	n/a	>10,310	>1.9 million years
Older Pleistocene	n/a	22,409	1.9 million to 22,400 years
Latest Pleistocene	22,409	12,000	22,400-12,000 years
Early Holocene	12,000	10,631	11,500-7,000 years
Middle Holocene	6880	4020	7,000-4,000 years
Late Holocene	3883	2062	4,000-2,000 years
Latest Holocene	2100	205	2,000-150 years
Historical-Modern	n/a	<1455	150-0 years
Artificial Cut and Fill	n/a	<1021	150-0 years
Water	n/a	n/a	Present

Notes: Includes dates from both natural and cultural contexts and surface and buried deposits.

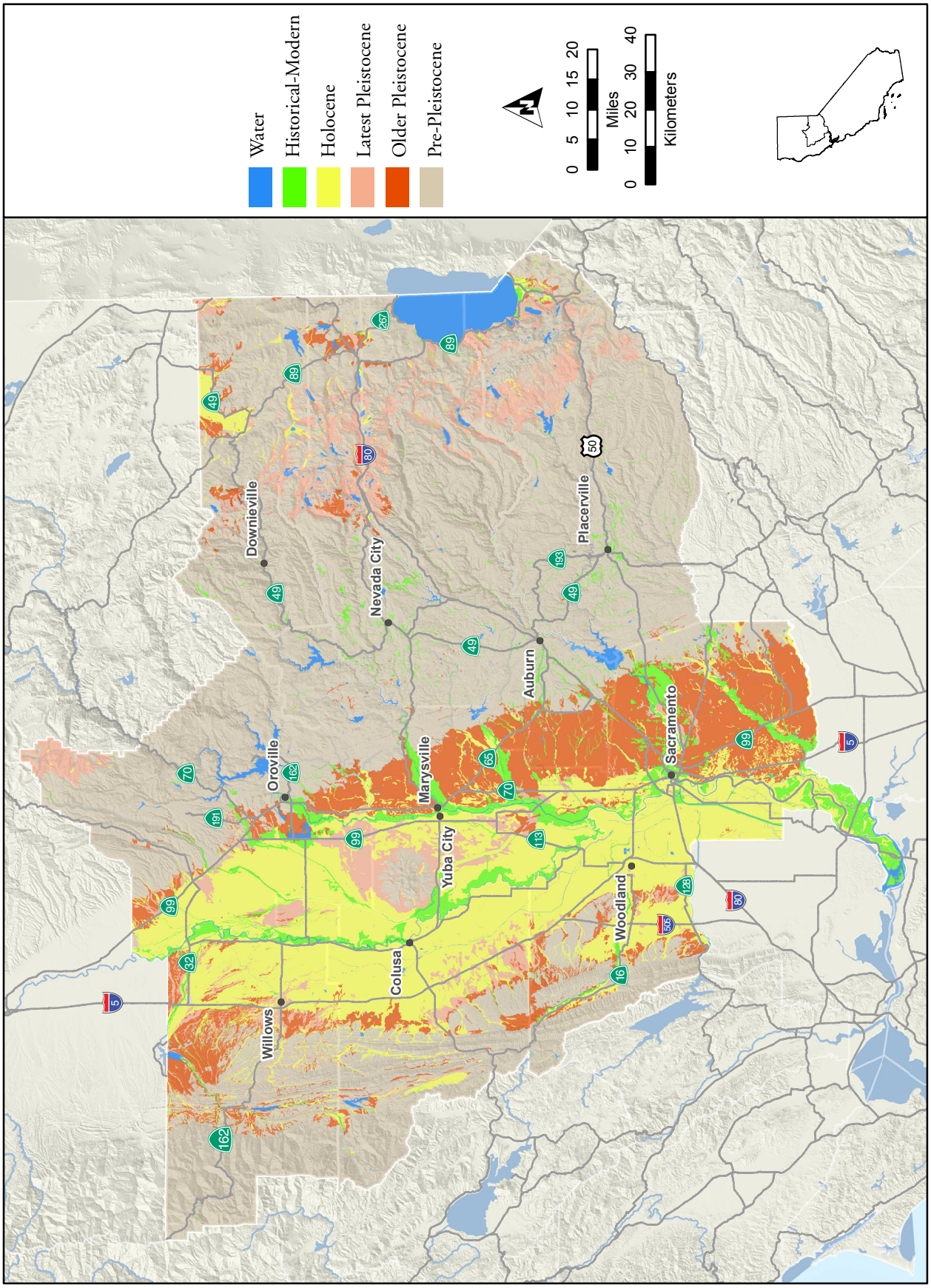


Figure 41. Major Landform-Age Groups in District 3.

Older Pleistocene Deposits (1.9 million to 22,000 years)

This unit includes landform-deposits previously mapped as the Red Bluff, Arroyo Seco, and Riverbank formations in the Sacramento Valley, some glacial deposits in the upper Sierra Nevada (Tioga and older), and possibly the Auburn, Bowie Flat, and Oroville deposits in the lower Sierra foothills. These formations and deposits are not differentiated within the map unit because they are too old to contain buried archaeological evidence. This unit is generally associated with landforms dominated by erosional processes that include dissected alluvial terraces and truncated alluvial fans that are generally located along valley margins (see Figure 41). The early and middle Pleistocene Red Bluff and Riverbank formations typically form high terraces or steep escarpments that represent the eroded and dissected remnants of older alluvial landforms, which sometimes occur at isolated locations. Together these landforms have slopes that range from 0 to 70%, with an average of about 6.4% overall. The unit covers more than 890,000 acres, or about 11% of District 3 (see Table 16).

Exposures of Red Bluff and Riverbank were found in the upper reaches of both large and small drainages, and were closely inspected at locations along the Sacramento River in Glenn County, Honcut Creek in Butte County, and Cache and Buckeye creeks in Yolo County. As shown in Figure 42, these deposits often contain a high percentage of gravel and have deeply weathered soil profiles that are usually red to reddish-brown in color, with very well-developed subsurface accumulations of clay and silica (Bt or Bq horizons respectively). Although good natural exposures of the lower Modesto Formation were difficult to find, a few examples were located along the west bank of the Feather River. The 103 soils series associated with these map units are primarily Alfisols, with the most common including the San Joaquin, Hillgate, Kimball, Perkins, and Redding series (see Appendix B for complete list).

Radiocarbon dates associated with this unit range from 5850 to 132 cal BP in the study area, but do not reflect the maximum age of the composite landform-deposit (see Table 17). A handful of these dates were derived from buried contexts at archaeological sites in Nevada and Placer counties, once again reflecting the lack of map-unit resolution in these upland areas. The age assignment is, however, consistent with the unit's geomorphic position and degree of soil development. In the field, it was observed that some Older Pleistocene land surfaces are locally overlain by a veneer of younger material, usually near stream or river channels, which appear to be Holocene-age alluvium or eolian deposits based on the lack of well-developed soil profiles (Figure 42).

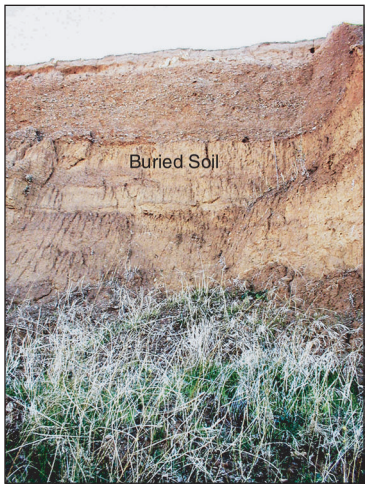
Although areas with Tehama-series soils in Glenn County closely correspond with areas previously mapped as the upper Riverbank Formation, and areas with Wyo-series soils correspond directly with areas previously mapped as the lower Modesto Formation by Blake et al. (1992), evidence obtained by this study indicates that the age of these soils are greatly overestimated.

Latest Pleistocene Deposits (22,000 to 11,500 cal BP)

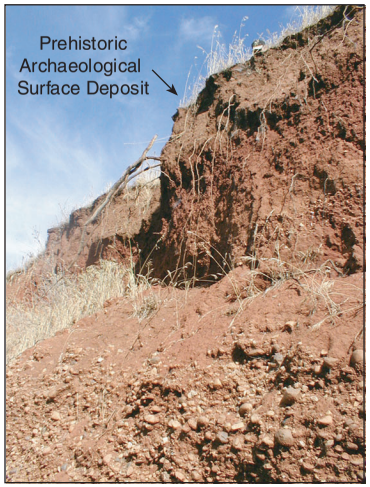
This group is generally associated with landforms that include dissected alluvial fans and floodplains in the lowlands, such as those mapped by this study on the Stony Creek fan in Glenn County, and along the west side of the Feather River between Biggs in Butte County and Live Oak in Sutter County, and on glacial moraines and outwash terraces in the upland areas (see Figure 41). The unit was also mapped over a sizable portion of the Llano Seco area in Butte and Glenn counties (Figure 43). These landforms have surface slopes that range from 0 to 75%, with an average of about 13.4% overall. The steepest examples are generally restricted to glacial landforms in upland settings. This unit covers nearly 590,000 acres, or about 7% of District 3 (see Table 16).

The map unit includes some landform-deposits previously identified either as the Riverbank or Modesto formations in the Sacramento Valley (e.g., Blake et al. 1992), and corresponds with Tioga-age glacial deposits in the upper Sierra Nevada, and possibly the Wyandotte deposits in the lower Sierra foothills. These formations and deposits were not differentiated within the map unit because they are generally too old to contain buried archaeological evidence. It was, however possible, to segregate some of the Late Pleistocene glacial deposits based on the information provided by the soils database (Figure 44).

Exposures of Latest Pleistocene deposits were found in the upper reaches of both large and small drainages, and were closely inspected at locations along the Sacramento River in Glenn County, the Feather River in Butte County, and Cottonwood Slough in Yolo County. As shown in Figure 45, these deposits have well-



Corning soil in Pleistocene deposit,
Buckeye Creek cutbank, Yolo County

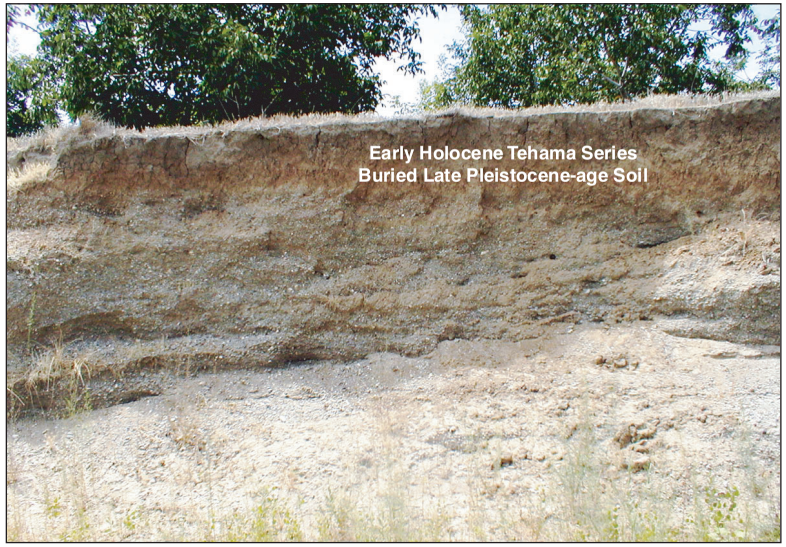


Redding soil in Pleistocene deposit
North Honcut Creek, Butte County

Late Pleistocene deposit exposed on
Sacramento River, Sutter County

Hillgate soil exposed in cutbank
of Lambs Valley Slough, Yolo County

Early Pleistocene terrace with Corning soil, Chickahominy Slough, Yolo County



Late Pleistocene-age buried soil at GLE-105, Sacramento River, Glenn County

Figure 42. Older Pleistocene-Age Depositional Landforms in District 3.

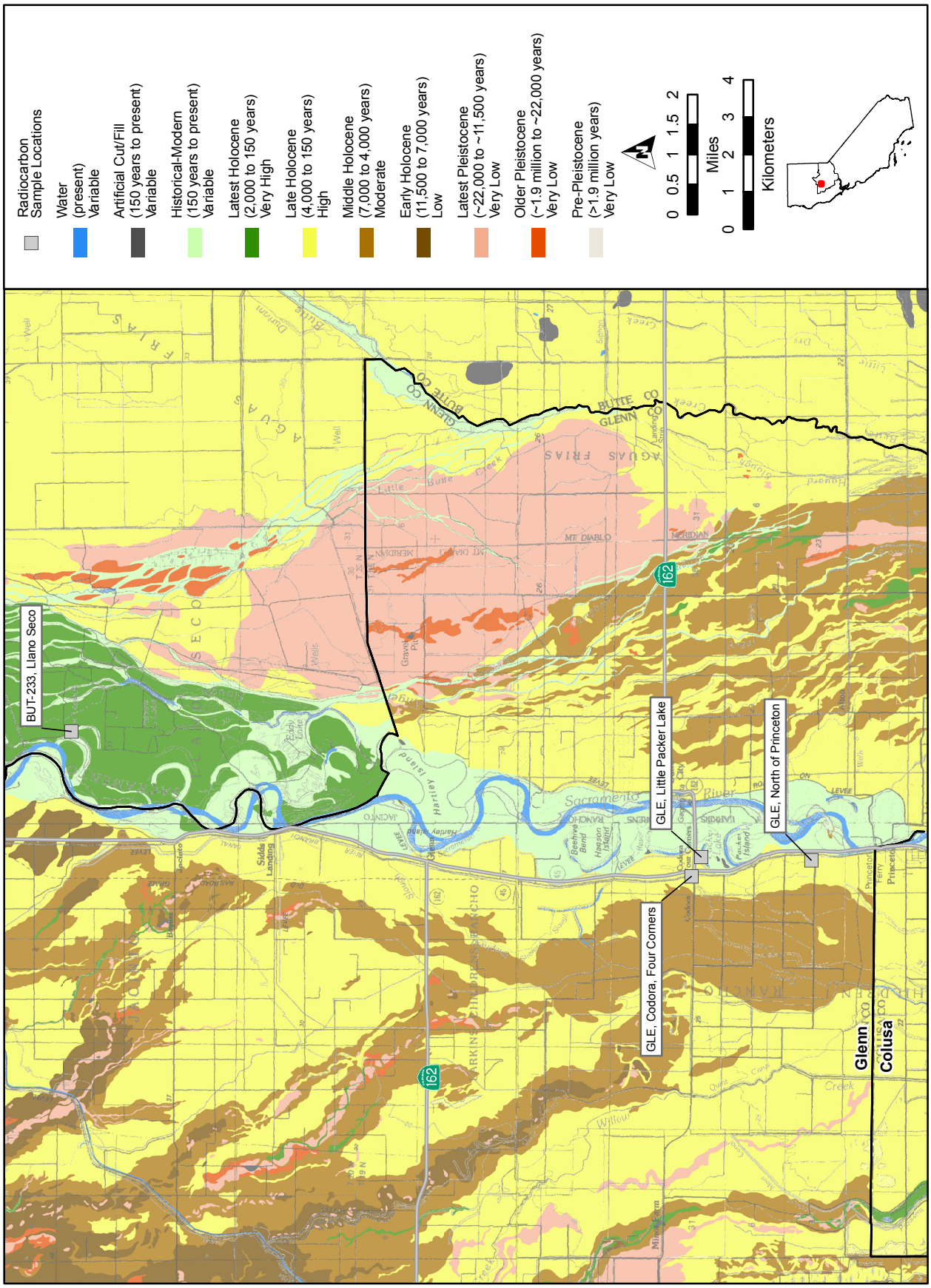


Figure 43. Depositional Landforms and Paleochannels in the Llano Seco Area.

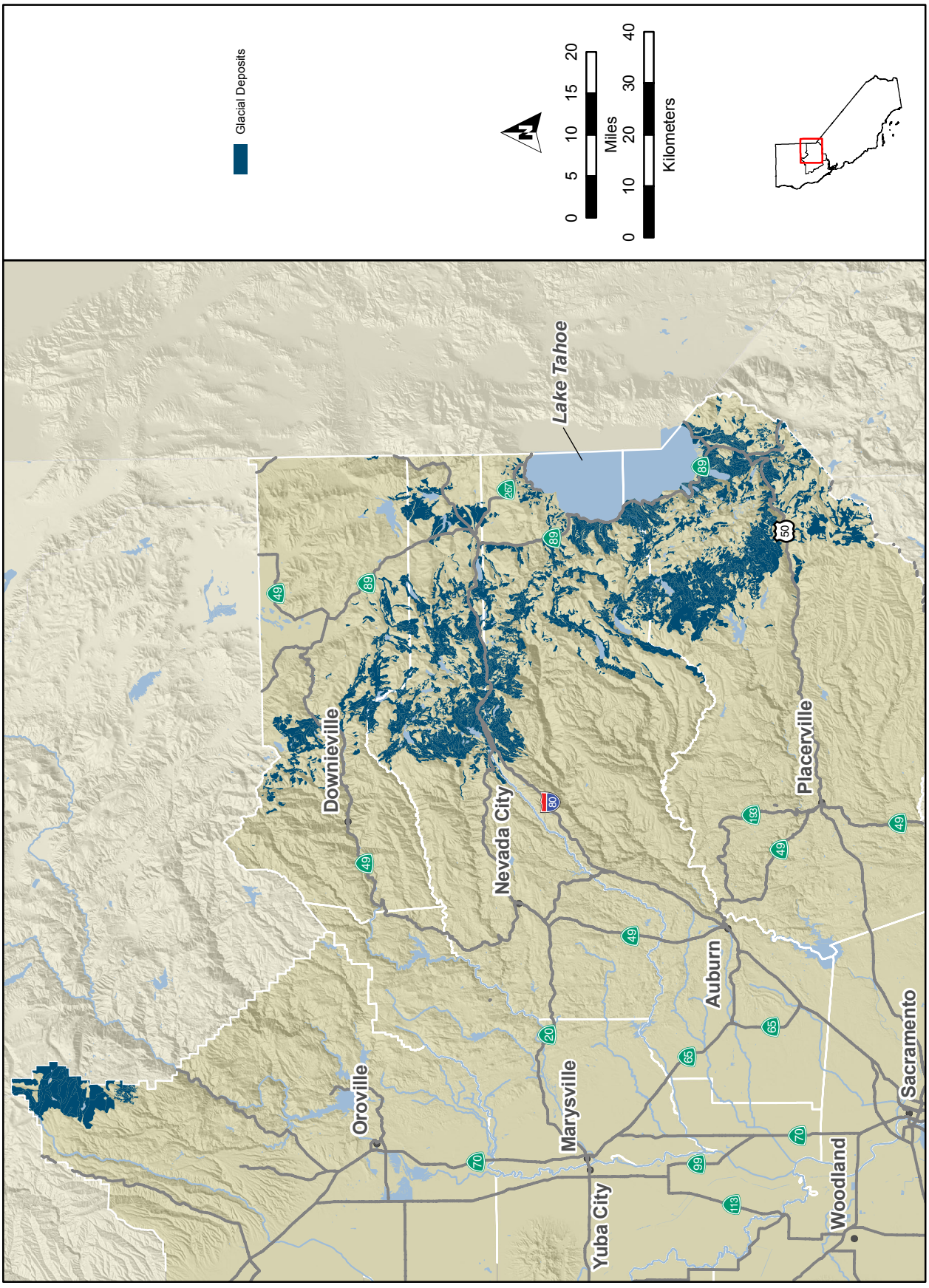
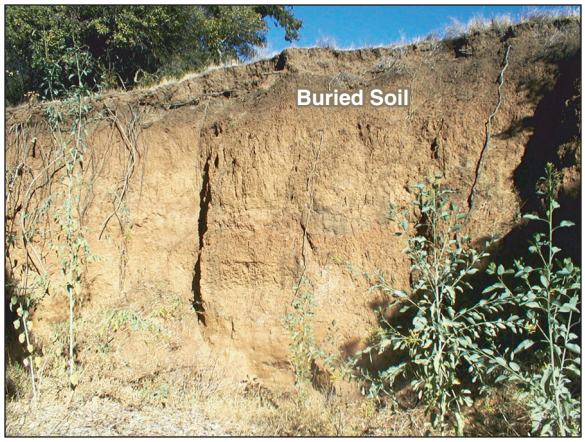


Figure 44. Distribution of Latest Pleistocene Glacial Deposits Based on Soil Survey Data.



Myer soil, Cottonwood Slough cutbank, Yolo County. Note veneer of younger surface deposits

Arbuckle soil overlying older Pleistocene deposits along the Sacramento River near the Glenn-Tehama County line

Saltcanyon soil exposed in cutbank of Freshwater Creek in Colusa County

Late Holocene Conejo soil overlying latest Pleistocene soil at CA-SUT-17 along the Sacramento River in Sutter County

Figure 45. Latest Pleistocene-Age Depositional Landforms in District 3.

developed soil profiles that are usually brown to reddish brown in color, with subsurface accumulations of clay and silica (Bt or Bq horizons respectively). Of the 78 soil-map units associated with these deposits, the Meeks and Tallac series are the most common upland types, and the Arbuckle, Gridley, Landlow, and Myers series are the most common lowland types (see Appendix B for complete list).

Radiocarbon dates associated with this landform-deposit range from 13,088 to 159 cal BP. Six of these dates are from buried contexts at archaeological sites in El Dorado or Placer counties, which reflect the lack of spatial and temporal resolution in the upland soil maps. As with the Older Pleistocene unit, some of the Latest Pleistocene land surfaces are locally overlain by a veneer of younger material, usually near stream or river channels, which appears to be Holocene-age alluvium or eolian deposits based on the lack of well-developed soil profiles (see Figure 45).

In the lowlands, the maximum age of this unit appears to be marked by a date of 22,409 cal BP (Beta-193913) from a well-developed buried soil (3Ab) exposed at a depth of about 8.3 meters in the south bank of Funks Creek in Colusa County (Meyer and White n.d.). The unit's minimum age is constrained by a date of 12,999 cal BP (Beta-233072) from a well-developed buried soil (3Ab) exposed in the west bank of the Sacramento River beneath a Tehama-series soil at site GLE-105, and by a date of 12,000 cal BP (OS-62975), from charcoal deeply buried in the C-horizon of the Tehama series alluvium along Chickahominy Slough in Yolo County; both were obtained for this study (see Table 14 and Figure 45). Based on this evidence, the Latest Pleistocene unit appears to be at least 12,000 years old in the lowlands (see Table 17). In addition, a date of 13,088 cal BP obtained near the base of Bunker Lake, which formed behind a terminal glacial moraine in Placer County, constrains the unit's minimum age in the uplands (Edlund 1994a).

Although areas with Wyo-series soils in Glenn County correspond to areas previously mapped as the lower Modesto Formation, and the Cortina and Orland series soils correspond with areas previously mapped as the upper Modesto Formation by Blake et al. (1992), the stratigraphic and radiocarbon evidence obtained by this study indicates that these deposits are actually late to latest Holocene in age. Thus, the age of these depositional landforms was greatly overestimated as previously identified and mapped.

Early Holocene Deposits (11,500 to 7000 cal BP)

The early Holocene unit is associated with landforms that include gently sloping alluvial fans and nearly level floodplains in the lowlands, such as those mapped by this study on the Stony Creek fan in Glenn County (Figure 46), along parts of western Sacramento Valley in Colusa and Yolo counties, and a large portion of the Llano Seco area in Butte and Glenn counties (Figure 47). The unit also forms a few moderately sloping floodplain-terraces in the Lake Tahoe area. Significantly, no early Holocene-age soil-unit was identified along the east side of the Sacramento Valley. These landforms have surfaces with slopes that range from 0 to 10%, with an average of about 2.1% slope overall. This unit covers more than 87,000 acres, or about 1% of District 3 (see Table 16).

These deposits were found exposed in the upper reaches of several streams that drain the northern Coast Ranges, and along the west bank of the Sacramento River at site GLE-105. As shown in Figure 45, these deposits are usually composed of fine-grained alluvium (sand, silt, and clay) and have moderately well-developed soil profiles that are usually dark gray to yellowish brown in color, with distinct subsurface accumulations of clay and/or calcium carbonate (Bt and Bk horizon respectively). In contrast to Pleistocene landforms, gravel was only found in the lowest parts of the early Holocene unit. Only four soil series are associated with these deposits, including the Rincon and Tehama series in the lowlands, and the Christofer-Gefo complex in the uplands (see Appendix B for list). Like some older units, a veneer of younger material locally overlies some early Holocene land surfaces near stream or river channels, which appears to be Holocene-age alluvium based on the lack of well-developed soil profiles (Figure 48).

Radiocarbon dates associated with this landform-deposit range from 12,999 to 1703 cal BP, with an average age of 5363 cal BP. The maximum age of the unit is constrained in the lowlands by a date of 12,999 cal BP (Beta-233072) from a soil buried beneath a Tehama-series soil at site GLE-105, and by a date of 12,000 cal BP (OS-62975), from charcoal deeply buried in the C-horizon of the Tehama series alluvium along Chickahominy Slough in Yolo County; both were obtained for this study (see Table 14 and Figure 45). The

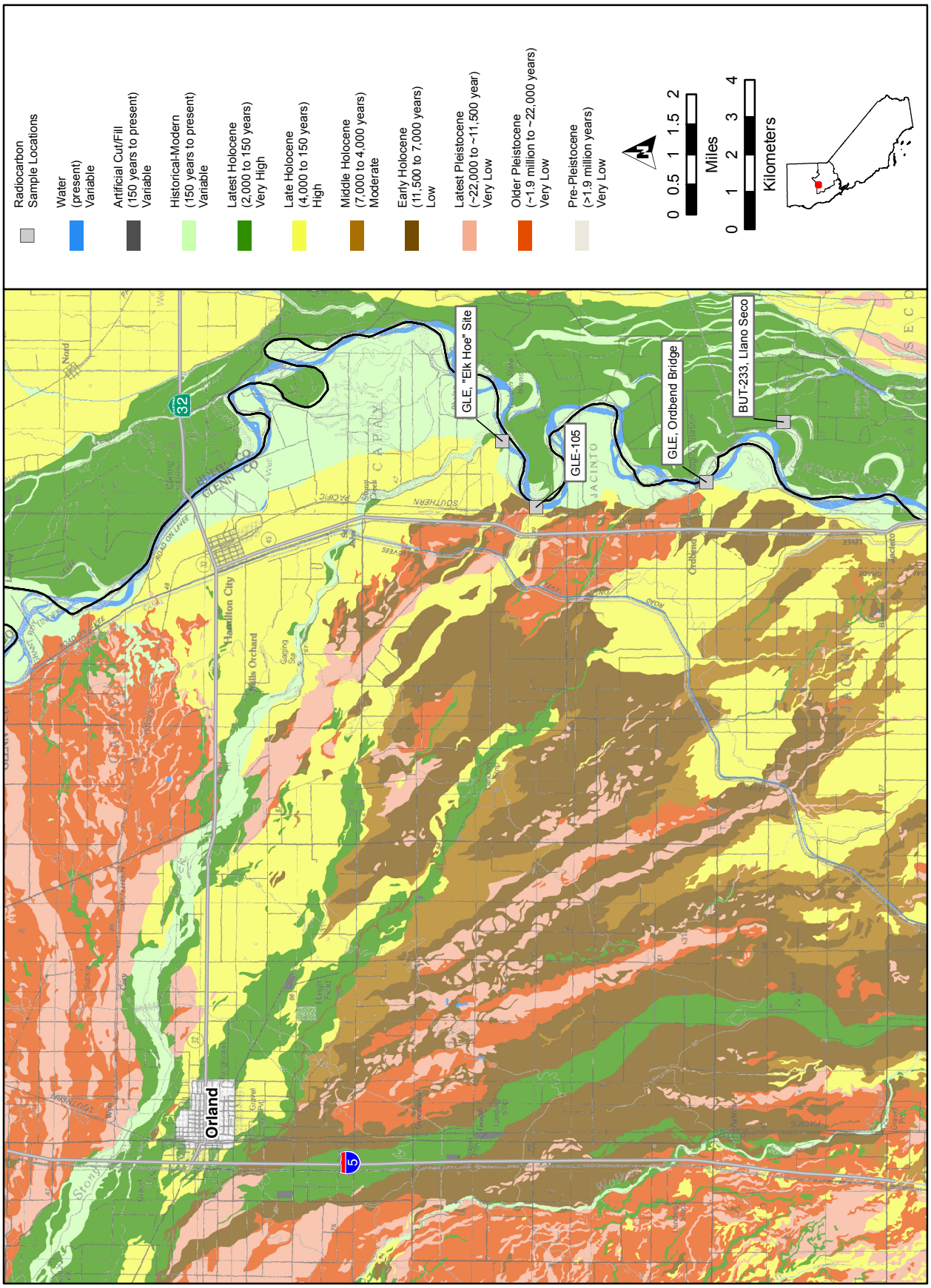


Figure 46. Depositional Landforms of the Stony Creek Alluvial Fan, Glenn County.

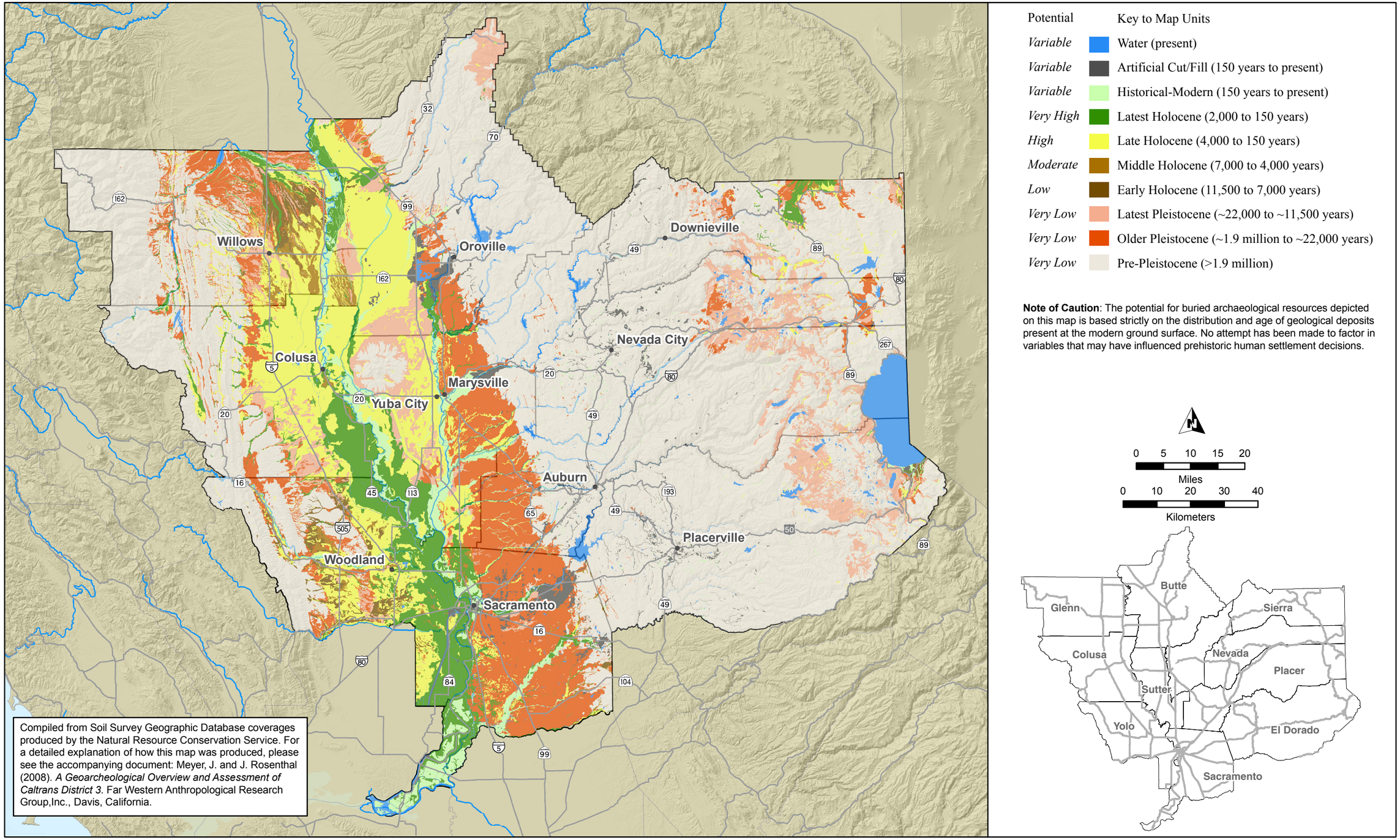
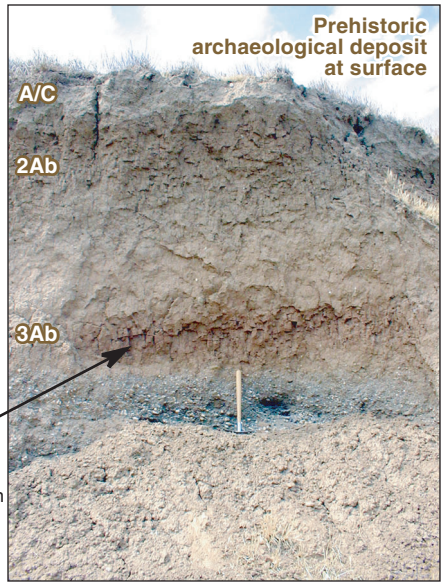


Figure 47. Pleistocene and Holocene Depositional Landforms and Buried Archaeological Potential, District 3.

Tehama-soil terrace at GLE-105 looking south along the west bank of the Sacramento River

Charcoal from hearth feature exposed at 70-76 cm depth in the Tehama soil dated to 2500 +/-40, or 2582 cal BP (OS-63002) at GLE-105



Tehama soil (2Ab) overlying well-developed late Pleistocene soil (3Ab) at GLE-105

Base of Tehama-soil terrace exposed along the Salt Creek branch of Chickahominy Slough in Yolo County

Tehama soil buried by late Holocene alluvium along Chickahominy Slough in Yolo County

Figure 48. Early Holocene-Age Depositional Landforms in District 3.

unit's minimum age is constrained by a date of 10,631 cal BP (OS-63029), obtained by this study from a buried soil formed at the top of the Tehama series alluvium along Chickahominy Slough in Yolo County, and by a previous date of 8590 cal BP from bone located on or above the Tehama soil at site GLE-105. In addition, a date of 2582 cal BP (OS-63002) from a discrete hearth feature associated with the Tehama soils at GLE-105 indicates the unit remained stable for at least 8,000 years (see Figure 48).

The early Holocene alluvium bearing Tehama-series soils are essentially identical to the areas previously mapped by Blake et al. (1992) on the Stony Creek fan in Glenn County as the middle Pleistocene-age upper Riverbank Formation (see Figure 46). However, since Riverbank is estimated to be more than 100,000 years old, the age discrepancy between these units is at least 88,000 years, or more than one entire geologic sub-stage (see Figure 2). We conclude that the Tehama-series soils were incorrectly associated with the Riverbank-age deposits, and should be considered as earliest Holocene in age.

The stratigraphic and radiocarbon evidence indicates that although deposition of this unit began around 12,000 cal BP, it ceased before 10,600 cal BP (see Table 17), which suggests the deposits were stable for human use throughout the earliest Holocene. As such, the unit represents a definable stratigraphic boundary between the Pleistocene and Holocene in the western Sacramento Valley.

Middle Holocene Deposits (7000 to 4000 cal BP)

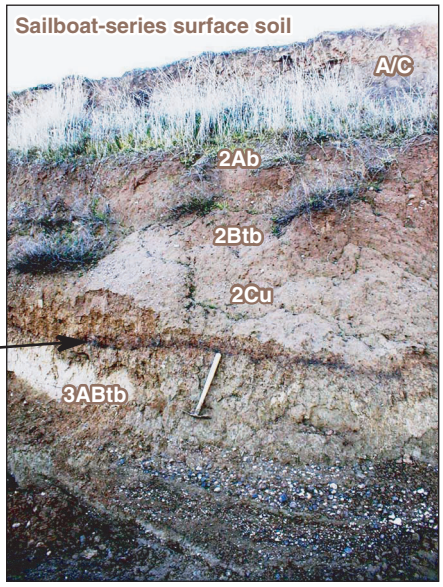
A middle Holocene map unit was identified that is primarily associated with gently sloping alluvial fans and nearly level basins and floodplains in the lowlands, such as those mapped by this study on the Stony Creek fan in Glenn County, along parts of western Sacramento Valley in Colusa and Yolo counties, a small portion of the Llano Seco area in Butte and Glenn counties, and in several isolated locations east of the Sacramento River in Sacramento County (see Figure 47). In the uplands, the unit forms a few moderately sloping alluvial fans and terraces within Long Valley and Sierra Valley in northeast Sierra County. These landforms have surfaces with slopes that range from 0 to 10 %, with an average of about 1.6% overall. This unit covers more than 85,000 acres, or about 1% of District 3 (see Table 16).

A few subsurface exposures of these deposits were found in the upper reaches of small streams on both sides of the valley, and on the east bank of the Sacramento River just north of the American River. As shown in Figure 49, these deposits are composed mainly of fine-grained alluvium (sand, silt, and clay) and moderately developed soil profiles that are black to pale yellow in color, with moderate subsurface accumulations of exchangeable sodium, clay, or calcium carbonate (Bn, Bt and Bk horizons respectively). Of the 13 soil series associated with these deposits, the Marvin, Plaza, Riz, and Hicksville series are the most common lowland types, while the Bidwell, Loyalton, and Balman series are the most common upland types (see Appendix B for list). Also associated with this unit is the Jacinto-series soil that formed in fine wind-blown sand derived from abandoned channels of Stony Creek, which form low, gently undulating dune ridges (Figure 50).

Though none of the soil series associated with this landform-deposit have been directly radiocarbon-dated, at least 47 middle Holocene dates have been obtained from District 3, including three as part of this study. The majority of these dates (n=24), which range from about 6880 to 4020 cal BP, are from buried contexts, followed by dates from tree stumps submerged in Lake Tahoe and other lakes in the region (n=16; mainly Lindström 1990), with only eight from surface contexts. Dated buried soils account for one-quarter of the total (n=12), and include a date of about 6000 cal BP from a soil beneath the cultural deposits at COL-247 (White 2003a), and dates of 4935 and 4316 cal BP from a soil that underlies the UC Davis campus in Yolo County (Shlemon and Begg 1972).

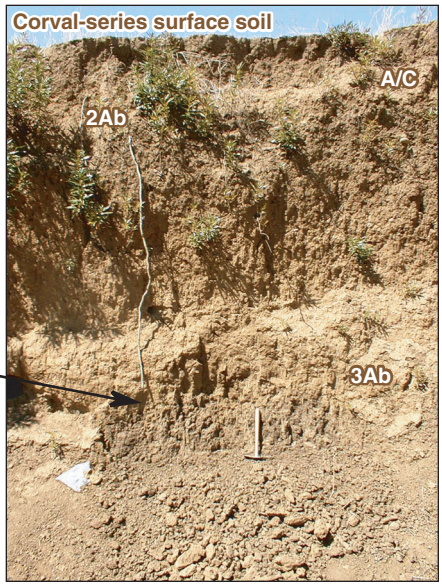
For this study, a date of 6230 cal BP (OS-62983) from a burned layer along Laguna Creek in Sacramento County, is nearly identical with a date of 6200 cal BP (OS-62873) from a soil buried along Salt Canyon in Colusa County (see Table 14; Figure 49). It should be noted that the surface of Laguna Creek, at the sample location, was mapped by this study as latest Holocene (Sailboat series), but the dated sample was collected from the base of a C horizon of a buried soil that fits the description of the Hicksville series (Figure 49). Based on this relationship, the Hicksville-series soils were mapped as a middle Holocene unit by this study. In addition, a deeply buried soil exposed in the west bank of the Sacramento River below site SAC-26 at Discovery Park produced a date of 4020 cal BP (Beta-233074), indicating that the main floodplain-terrace of the American River is at least middle Holocene-age.

Burn layer exposed in Hicksville-soil terrace along the south bank of Laguna Creek in Sacramento County



Sample of Laguna Creek burn layer dated to 5410 +/-40 BP, or 6230 cal BP (OS-62983)

Northeast bank of Salt Creek near Highway 20 in Colusa County looking east



Buried 3Ab soil dated to 5380 +/-35 BP, or 6200 cal BP (OS-62873) along Salt Creek

Figure 49. Middle Holocene-Age Depositional Landforms in District 3.

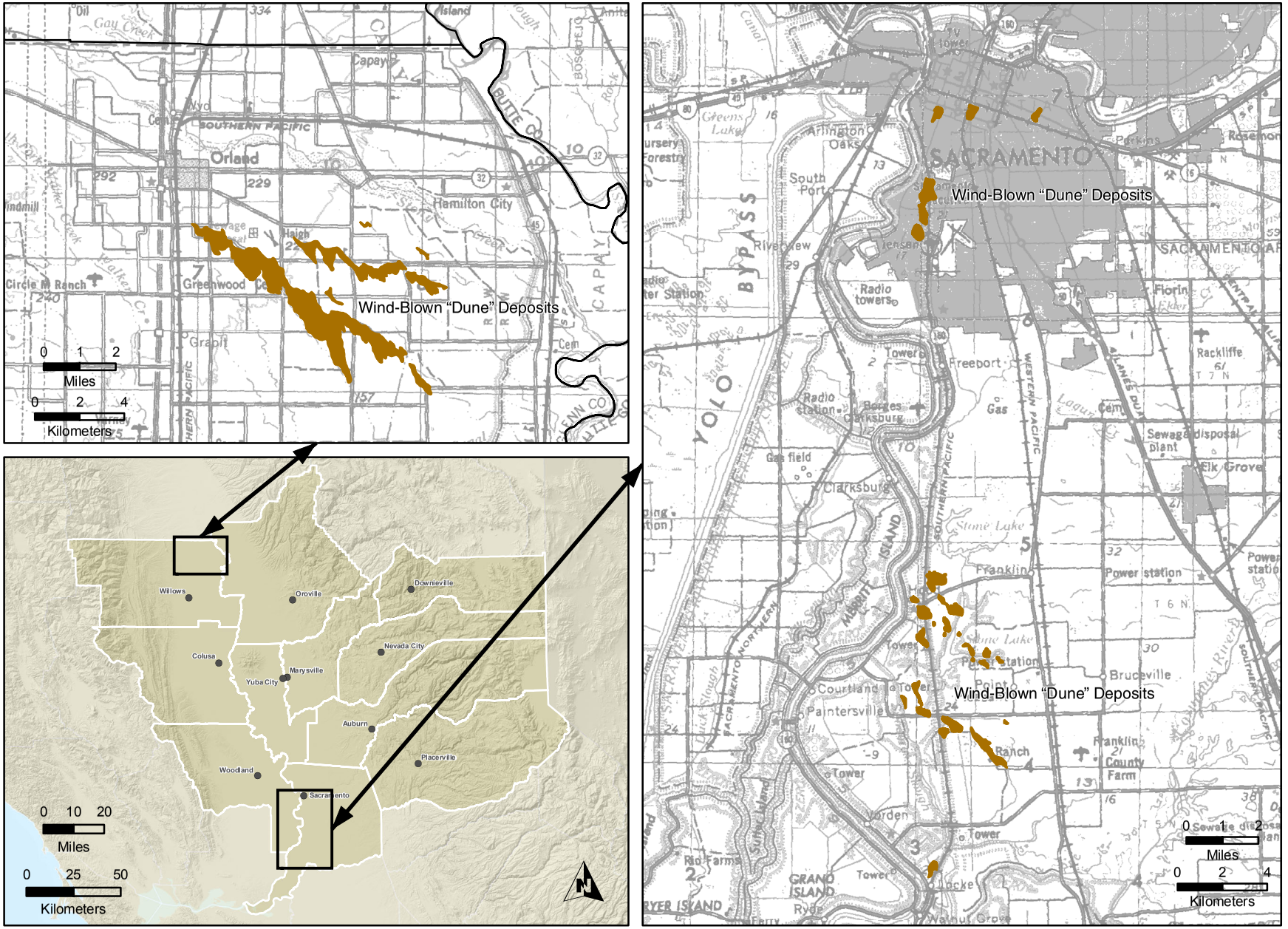


Figure 50. Distribution of Wind-Blown "Dune" Deposits Based on Soil Survey Data.

Together this evidence indicates that middle Holocene-age strata are frequently buried in depositional landforms such as alluvial fans and floodplains, but are represented at the ground surface in a few areas. In Glenn County, floodplain alluvium bearing soils of the Marvin and Plaza series correspond with areas previously mapped as the lower Modesto Formation by Blake et al. (1992), as does the wind-blown dunes bearing Jacinto soils. Since lower Modesto is estimated to be more than 22,000 years old, there is an apparent age discrepancy of 15,000 years or more. While the Marvin and Plaza soils have developed Bt and Bk horizons that likely explains the previous age assignment, these soils also have elevated levels of sodium that accelerates the rate of soil development; the Riz soils in Glenn and Yolo counties are a similar case. From this we conclude that the Jacinto, Marvin, and Plaza soils were incorrectly associated with lower Modesto-age deposits and should instead be considered as middle Holocene in age.

Late Holocene (4000 to 150 cal BP)

The late Holocene map unit is primarily associated with very gently sloping alluvial fans and nearly level basins and floodplains in the lowlands, such as those mapped by this study throughout much of the lower Sacramento Valley, and in several valleys of the eastern Sierra Nevada uplands (see Figure 47). These landforms have surfaces with slopes that range from 0 to 9%, with an average of about 1.2% overall. This unit covers more than 900,000 acres, or more than 11% of District 3 (see Table 16).

Numerous subsurface exposures of these deposits were found in the upper reaches of small streams on both sides of the valley, and along the banks of each major river channel. As shown in Figure 51 and Figure 52, these deposits mainly consist of fine-grained alluvium (sand, silt, and clay) with moderately to weakly developed soil profiles that are black to pale yellow in color, which often have increased subsurface structure and/or minor accumulations of exchangeable sodium or calcium carbonate (Bw, Bn and Bk horizons respectively). Of the 67 soil series associated with these deposits, the Capay, Westfan, Willows, Wyo, and Yolo series are some of the most common lowland types, while the Wafap-Hamslough complex, and Bidhart and Coolbrith series are the most common upland types (see Appendix B for list).

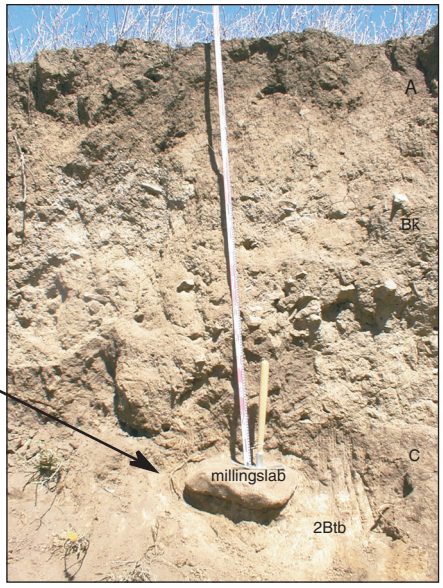
At least 43 radiocarbon dates, ranging in age from 7315 to 159 cal BP are associated with this map-unit, including six obtained specifically for this study. All dates older than 2340 cal BP originate from buried contexts, including buried archaeological deposits at BUT-294 and COL-247. In the uplands, a date of 3765 cal BP from a buried context constrains the age of a group of alluvial soils known as Aquolls and Boralls that are mapped at the surface of Sardine Valley in Sierra County (see Wigand in Waechter and Andolina 2005).

As part of this study, the maximum age of the Westfan-series soils was constrained by a date of 3883 cal BP (Beta-233071) from charcoal below a millingslab at the upper Freshwater Creek site, and by a date of 2062 cal BP (OS-62979) from a buried soil exposed along the south bank of Salt Creek on the valley floor near Arbuckle, both in Colusa County (see Table 14; Figure 51). The maximum age of the Wyo-series soil was also constrained by two dates from underlying buried soils: one of 3670 cal BP (OS-63002) from south of the Ordbend Bridge in Glenn County, and a second of 2342 cal BP (OS-63100) from site GLE-105, both on the west bank of the Sacramento River (Figure 51). While Blake et al. (1992) mapped floodplain alluvium bearing the Wyo-series as the lower Modesto Formation in Glenn County, it appears the unit's age was overestimated by least 18,000 years, and that Wyo soils date to the late Holocene instead.

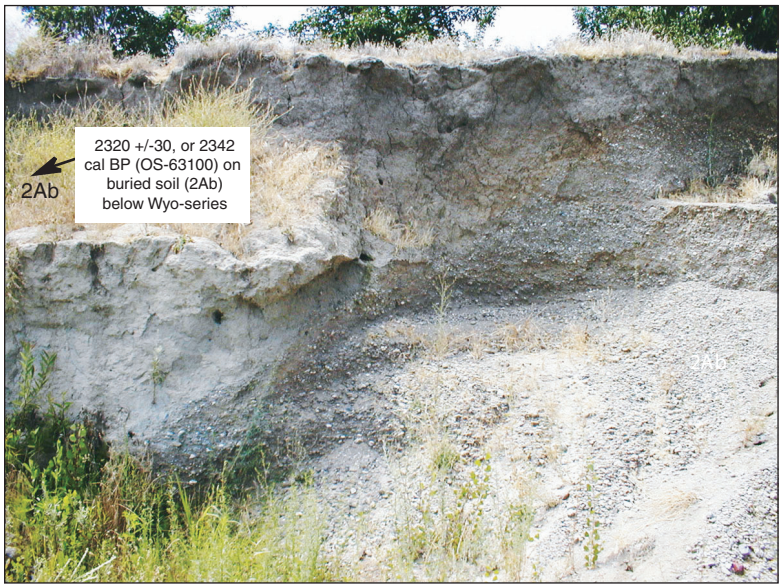
The maximum age of the Zamora-series soils was constrained by a date 3389 cal BP (Beta-233073) from a buried soil exposed along the south bank of Nye Creek (Figure 52), near State Route 162 in Glenn County, and by a Napa obsidian hydration value of 4.0 microns from a flake associated with a discrete cultural feature buried 6.2 meters below the north bank of Lamb Valley Slough in Yolo County (Figure 52), which converts to an age of at least 2400 cal BP based on the rate proposed by Origer (1982).

Other dates that provide limiting maximum age for soils associated with this unit include: a date of 3320 cal BP from a buried soil in the Best Slough floodplain (Yuba County) that limits the age of the overlying Conejo-series soil (Eidsness and Meyer 1999); and a buried cultural deposit and soil that date to 1560 cal BP at site COL-247, which provides a maximum age for the overlying Moonbend-series soil (White 2003a). Although the Conejo soils were associated with the upper Modesto Formation by Busacca et al. (1989), the radiocarbon and stratigraphic evidence indicates it is late Holocene in age.

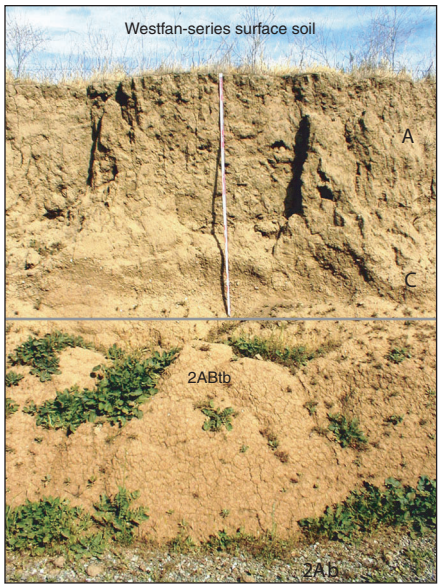
Westfan-soil terrace and archaeological site exposed along upper Freshwater Creek in Colusa County looking northeast



Date of 3580 +/-40 BP, or 3883 cal BP (Beta-233071) on charcoal below millingslab at base of Westfan-series soil



Contact of Wyo soil terrace (left) with latest Pleistocene gravel (right), west bank of the Sacramento River at site CA-GLE-105 in Glenn County



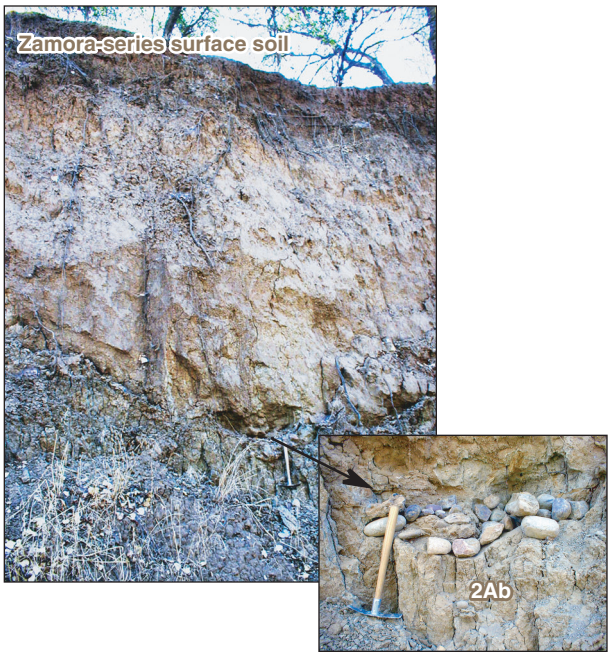
Date of 2090 +/-35 BP, or 2062 cal BP (OS-62979) on 2ABtb soil buried by the Westfan-series soil

Figure 51. Late Holocene-Age Depositional Landforms in District 3.

Zamora-soil terrace along the Nye Creek near Highway 162 in Glenn County looking southeast

Date of 3160 +/-40 BP, or 3389 cal BP (Beta-233073) from buried 2Ab soil

Pointing to site CA-SAC-26 buried in the American River floodplain, east bank Sacramento River at Discovery Park



Napa obsidian with ~4.0 mu (~2400 cal BP) from cultural feature below Zamora-series, Lamb Valley Slough, Yolo County

Figure 52. Late Holocene-Age Depositional Landforms in District 3.

One additional date of 2841 cal BP (Beta-233075), from a buried soil exposed in the east bank of the Sacramento River at Discovery Park (see Figure 52), marks a period of stability on the American River floodplain and limits the age of the overlying cultural deposit (site SAC-26) that is buried by the Columbia-series soil which is mapped by this study as historical to modern in age. The minimum age of the unit is constrained by a date of 159 cal BP from the surface of the Yolo-series soil at site YOL-187 (Wohlgemuth n.d.), which is why the unit's age is bracketed between 4000 and 150 cal BP.

This evidence shows that the late Holocene unit is one of the most extensive on the Sacramento Valley floor, and that this unit often overlies older land surfaces (i.e., buried soils) that were buried sometime between about 3800 and 2000 cal BP, along with some known archaeological deposits. While the radiocarbon evidence suggests that many portions of the late Holocene unit are likely latest Holocene in age, the available soil data and temporal information do not permit the age of the associated soil-units to be confidently subdivided beyond the 4000 to 150 cal BP bracket (see Table 17). It was possible, however, to subdivide other soil-units into a latest Holocene map-unit as described below.

Latest Holocene (2,000 to 150 cal BP)

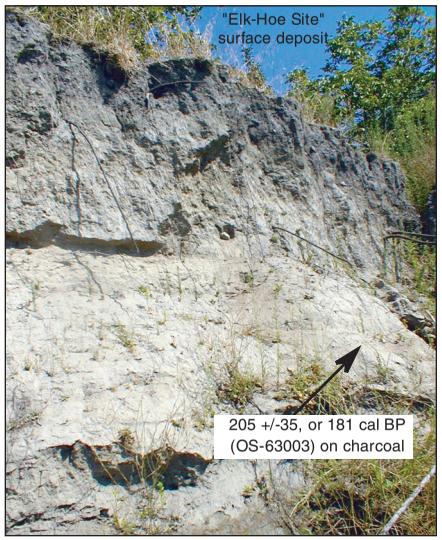
The latest Holocene map unit is associated almost exclusively with gently sloping alluvial fans, natural levees, and nearly level basins and floodplains in the lowlands, such as those mapped by this study through the axis of the lower Sacramento Valley, and in some upland valleys like Bear Valley in Colusa County and Sierra Valley in the eastern Sierra Nevada (see Figure 47). These landforms have surfaces with slopes that range from 0 to 8%, with an average of about 1.1% overall. This unit covers more than 476,000 acres, or nearly 5.9% of District 3 (see Table 16).

Numerous subsurface exposures of these deposits were found in the upper reaches of small streams on both sides of the valley, and along the banks of each major river channel. As shown in Figure 53, these deposits mainly consist of fine-grained alluvium (sand, silt, and clay) with weakly to very weakly developed soil profiles that are dark gray to yellowish brown in color, which sometimes have increased subsurface structure or minor accumulations of calcium carbonate (Bw and Bk horizons respectively). Of the 48 series associated with these deposits, the Clear Lake, Gianella, Orland, Sacramento, Sailboat, and Vina series are some of the most common lowland types, while the Ballman-Ramelli complex, and Bieber and Pasquetti series are some of the most common upland types (see Appendix B for list). Soils of the Tinnin-series are also associated with this unit, which consist of wind-blown granitic sand that form a series of low, discontinuous dune ridges along the east side of the lower Sacramento River in Sacramento County (see Figure 50).

At least 127 radiocarbon dates, ranging in age from 14,468 to 115 cal BP are associated with this map-unit, including two obtained by this study. All of these are from the lowlands, with the majority (n=90, or 71%) derived from surface contexts. All dates older than 2132 cal BP are from buried contexts, with the oldest surface context dating to 2005 cal BP at SAC-42 (Milliken 1995). Nearly 16% of the dates are from buried soils, with more than one-half originating from buried cultural contexts at sites BUT-233, COL-158, -247, and SAC-42 (Milliken 1995; White 2003a).

For this study, the maximum age of the Orland-series soils was constrained by a date of 181 cal BP (OS-63003) from charcoal exposed in the C horizon in the west bank of the Sacramento River in Glenn County, 2.0 meters below the "Elk-Hoe" site (see Table 14; Figure 53). While floodplain alluvium bearing Orland-series soils were mapped by Blake et al. (1992) simply as Holocene-age "stream channel deposits," the current dating results indicate that Orland soils are only latest Holocene in age. In addition, dates from soils buried below the Parrott, Sailboat, Valpac, Vina, and Wilsoncreek-Trainer series, provide maximum limiting ages for these latest Holocene map units (Table 18), as does a date from a hearth feature associated with a buried soil along Chickahominy Slough in Yolo County (Figure 53). The buried soil dates suggest that much of the latest Holocene unit is no more than 1,000 years old, while the date from the Orland series shows that some portions are as little as a few hundred years old.

As with the undivided late Holocene-unit, these deposits often overlie land surfaces (i.e., buried soils) that were stable for part or all of the Holocene, some which contain buried archaeological deposits in District 3. The associated radiocarbon dates suggest that the unit has buried many soils that are at least 700 years old, and



Orland-series soil in west bank of the Sacramento River in Glenn County

Buried hearth feature in southeast bank of Chickahominy Slough, Yolo County

Date of 745 +/-25 BP, or 682 cal BP (OS-63004) on charcoal from buried hearth feature

Stream meander through Venado-series surface soil in Bear Valley, Colusa County looking west

Corval-series surface soil overlying Capay-series soil along Salt Creek near Highway 20 in Colusa County

Figure 53. Latest Holocene-Age Depositional Landforms in District 3.

Table 18. Maximum Age of Soils Associated with Latest Holocene Unit.

County, Area or Site	Context	Deposit	Minimum Age	Cal BP [a]	Maximum Age	Associated Surface Soil
GLE, "Elk Hoe Site"	Natural	C Horizon	138	181	223	Orland
BUT, Honcut Creek-B	Natural	Buried soil	429	504	549	Wilsoncreek-Trainer
COL-245/H	Cultural	Buried soil	673	768	911	Vina
SAC-042	Cultural	Buried soil	908	985	1089	Valpac
COL-158	Cultural	Buried soil	891	1004	1178	Vina
BUT-233, Llano Seco	Cultural	Buried soil	955	1116	1284	Parrott
SAC, Dry Creek-B	Natural	Buried soil	3399	3511	3630	Saiboat

Notes: [a] Median probability.

has consistently buried deposits more than 2,100 years old. Together, the evidence indicates that latest Holocene-age depositional landforms can be reliably bracketed between about 2000 cal BP and 150 cal BP (see Table 17), but may locally contain some deposits that are slightly older or younger than this.

Historical to Modern (150 cal BP to present)

This map unit includes sediments deposited by natural processes in active channels and low floodplains, such as those mapped along most rivers and streams by this study, as well as the marshes and floodplains in the Delta region that have been artificially stabilized by the construction of levees and/or drainage systems (see Figure 47). These landforms have surfaces with slopes that range from 0 to 15%, with an average of about 1.5% overall. This unit covers nearly 250,000 acres, or nearly 3.1% of District 3 (see Table 16). The unit is distinguished from historical to modern deposits that represent artificial cut-and-fill.

Numerous deposits were seen exposed in the upper reaches of small streams on both sides of the valley, and along parts of the Sacramento River, where they often form the first inset terrace above the active channel. These deposits were repeatedly found in the lower reaches of drainages whose upper reaches were mined for gold, particularly those in which hydraulic mining was used (e.g., American, Bear, Cosumnes, Feather, and Yuba rivers). While the nature and texture of these deposits vary considerably from one location to another, most consist of fine-grained alluvium (sand, silt, and clay) with undeveloped or very weakly developed soil profiles that are gray to yellow in color, which are characterized by simple C or A/C horizons. Of the 36 soil series associated with these deposits, the Columbia, Cosumnes, Holillipah, Nueva, Shanghai, and Tujunga series are some of the most typical lowland types, while the Tahoe, Beaches, and Watah series are common upland types (see Appendix B for list).

At least 19 radiocarbon dates, ranging in age from 12,540 to 519 cal are associated with this map-unit; two are from this study. The majority (n=13, or ~68%) of these dates are from the lowlands, with all but one date associated with buried contexts (Table 19). Only a date of 519 cal BP from SAC-151 is associated with a surface context (Schulz 1981); though the dated samples exact location is uncertain. Nearly two-thirds of these (n=13) are from buried marsh deposits, with two from the buried soils identified by this study at Discovery Park in Sacramento, and one from a buried cultural context at SAC-168B in the Cosumnes River floodplain (Ragir 1972).

Table 19. Maximum Age of Soils Associated with Historical-Modern Unit.

County, Area or Site	Type	Deposit	Lower	Cal BP [a]	Upper	Series Name
ELD, Meyers Grade Marsh	Natural	Buried marsh	1287	1455	1636	Tahoe
SAC, Steamboad Landing	Natural	Buried marsh	1717	1853	1951	Columbia
ELD, Taylor Marsh	Natural	Buried Marsh	2726	3019	3383	Watah
SAC-168B	Cultural	Buried soil	2844	3252	3641	Cosumnes
SAC, Sherman Island-A	Natural	Buried marsh	3963	4327	4709	Fluvaquents
SAC, Sherman Island-B	Natural	Buried marsh	4422	4948	5338	Gazwell
SAC, Andrus Island	Natural	Buried marsh	4851	5359	5755	Rindge

Notes: [a] Median probability.

While these dates do not reflect the unit's minimum age, the low geomorphic position, poor soil development, and close relationship with drainages that were intensively mined during the historic period strongly suggest that this unit is historical to modern in age (see Table 17). It is likely that many small areas of these deposits have not been mapped in the uplands, due in part to the lower resolution of the maps and the somewhat idiosyncratic nature of mining activities that may have generated these sediments. As formation of this unit is ongoing in some areas, its complete distribution is not depicted by the soil-map units.

Artificial Cut and Fill (150 cal BP to present)

This unit includes a series of artificial (i.e., man-made) deposits that were either created by mechanical cutting (e.g., borrow/gravel pits, mines, quarries, waterways), mechanical filling (e.g., dredge/mine tailings, dumps/landfills, made land), construction (e.g., dams, levees, marinas, road prisms, railroad beds), and intensive human development (i.e., urban land). Extensive areas of mine tailings are present along portions of the American, Feather, and Yuba rivers near the base of the foothills, and numerous large gravel pits are present in Sacramento County east of Sacramento (see Figure 47). These landforms have surfaces with slopes that range from 0 to 99%, with an average of about 17.6% overall. This unit covers a little more than 115,000 acres, or about 1.4% of District 3 (see Table 16). The unit is distinguished from historical to modern deposits that were naturally deposited.

While there is considerable variation in the nature and texture of these deposits from location, they generally have undeveloped soil profiles, either because they have not been stable long enough, or because they were designed to resist weathering (e.g., dams, engineered fill). Of the 24 soil series associated with these deposits, those related to mining, quarries, and urban land are the most common (see Appendix B for list).

Only two radiocarbon dates from buried contexts are associated with this map-unit, providing a maximum age. These include a date of 1320 cal BP on charcoal from site SAC-205, which was buried by more than 1.8 meters of mine tailings along the American River (West et al. 2001), and a date of 1021 cal BP on wood from a depth of more than 15 meters obtained from a core placed near Sutters Lake and the Federal Courthouse in downtown Sacramento (West 1998). While the unit's minimum age is obviously modern, its maximum age is presumed to coincide with the start of the historic period around 150 years ago (see Table 17). Given the ongoing "formation" of this unit, its complete distribution is not depicted by the SSURGO soil maps.

Water (Present)

This map unit includes existing bodies of water such as ponds, lakes, reservoirs, bays, canals, streams, and rivers that were large enough to be mapped at the scale of the SSURGO-data, with the largest being Lake Tahoe. This unit is essentially level, and covers a little more than 212,000 acres, or about 2.6% of District 3 (see Table 16).

In total, 34 radiocarbon dates ranging in age from 11,524 to 110 cal BP are associated with this unit, with the oldest date from the base of Osgood Swamp in El Dorado County (Adam 1967). All but two of the dates are from upland locations, with the majority from tree stumps submerged in Sierra Nevada lakes, most from Lake Tahoe. The existence and average age of these stumps confirm that lake levels dropped dramatically during the middle Holocene, which allowed trees to colonize the outer lake bed by about 5360 cal BP (Lindström 1990). Also included are two dates from BUT-84, a site covered by water in the 1960s after the Oroville Reservoir was constructed on the Feather River. That this "unit" consists of water, its age is considered the present (see Table 17).

Field and Mapping Summary

Since the potential for buried archaeological deposits is closely linked to the existence and age of depositional landforms, this assessment focused on the need to determine the ages of key strata to improve the temporal resolution of the regional chronostratigraphic sequence. This was done by compiling existing soil, geologic, radiocarbon, and archaeological information, and integrating this with new evidence obtained from field studies. As a result, nine landform units of different ages were identified and mapped throughout the more than eight million acres of District 3. The map is one of the most detailed representations of surface deposits yet developed for central California, based on one of the best-defined and well-dated chronostratigraphic sequences in the region. Since the distribution of different age groups was mapped using the digitized soil survey data, the spatial resolution of the map is inherently limited to the original data (e.g., lowlands more detailed than uplands)

and reflect differences in the way that each area was mapped. Nonetheless, the map provides a firm foundation for estimating the potential of buried archaeological resources throughout District 3.

The field efforts also resulted in the identification of a definitive Pleistocene-Holocene stratigraphic boundary, the existence of middle Holocene strata and the subdivision of the Holocene and Historical eras into six sub-units with defined temporal brackets. This study has identified and resolved some geologic problems that previously limited our knowledge of depositional landforms in District 3. From these findings, an expanded and refined picture of landscape evolution is emerging that has obvious implications for the nature and completeness of the region's archaeological record, as discussed below.

SUMMARY OF LATE QUATERNARY LANDSCAPE CHANGES

It is apparent that the landscape in District 3 has been repeatedly altered and shaped by a complex sequence of large-scale environmental changes. Over just the past 22,000 years, the region has experienced the widespread effects of deglaciation, sea-level rise, and flooding, as well as historic-period gold mining, levee construction, and land reclamation. Widespread erosion of the uplands led to the formation of extensive depositional landforms in the lowlands, such as fans, floodplains, and natural levees. The presence of buried soils at the top of multiple alluvial sequences indicates that episodes of sediment deposition were relatively short (annual or decadal scales) compared to the long periods of landform stability and soil formation that followed (centennial and millennial scales). Region-wide episodes of landform development and stability, were accompanied by localized changes in the position and size of stream and river channels, and presumably, in the type and distribution of associated plant and animal habitats (e.g., dissected uplands, flood basins, riparian corridors, wetlands), and human settlements. Since many substantial changes occurred during the time that people occupied the region, the following section reconstructs the evolution of the landscape by combining the previous soil and geologic data with that generated for this study.

Pre-Pleistocene

The oldest and most eroded portions of the landscape, represented by the Pre-Pleistocene unit in Figure 41 and Figure 47, are generally found in the uplands of the Coast and Sierra-Cascade ranges, but also emerge in a few places on the Sacramento Valley floor, including the Dunnigan Hills, Plainfield Ridge, and Sutter Buttes. These landforms typically include shallow soils formed on bedrock and consist of hills, ridges, mountains, and canyons. While these old landscapes have been dissected by erosion, there has been no significant change in their overall configuration during the span of human occupation.

Early to Late Pleistocene

Prior to the latest Pleistocene (>22,000 cal BP), uplift, erosion, and glaciation of the Sierra Nevada resulted in the deposition of large alluvial fans along the eastern side of the Sacramento Valley, which form a broad pediment-plain mapped as Older Pleistocene deposits (see Figure 41 and Figure 47). Much smaller fans also formed along the valley's eastern side by streams draining the Cascade Range. On the western side of the valley, many discontinuous fans were formed by smaller streams that drained the Coast Ranges, with the largest being the Stony Creek fan (see Figure 46). At this time, the main channel of Stony Creek followed a more northerly course and the fan's distal-end extended west beyond the current position of the Sacramento River channel, which must have been located farther east. In the uplands, Older Pleistocene deposits consist of glacial moraines, till, and outwash terraces that were either formed before or during the Tahoe-advance (see Figure 47).

The Older Pleistocene landforms were subsequently dissected by erosion, particularly by the incision of gullies and channels. In the glaciated watersheds of the American, Bear, Cosumnes, Feather, and Yuba rivers, channels became deeply incised below the surface of the surrounding fans, effectively "locking" them into their current positions. Within the largely un-glaciated watershed of Stony Creek, which drains the Coast Ranges, a deeply incised channel did not develop during the early to late Pleistocene. Instead, this drainage formed a series of lesser-age fans as the channel continued to migrate laterally across the valley floor (see Figure 46). The nature and extent of the Older Pleistocene deposits indicate that some large areas have remained relatively stable, while

other segments have either been removed by erosion and/or buried by younger deposits, particularly near the axis of the Sacramento Valley.

Latest Pleistocene

Glaciation of the Sierra-Cascade range during the latest Pleistocene (22,000 to 11,500 cal BP) resulted in the deposition of till, moraines, and outwash terraces as part of the Tioga-advance (see Figure 17). These glacial deposits are more than 13,000 years old based on radiocarbon dates from District 3 and elsewhere in the Sierra Nevada (see Table 1). A radiocarbon date obtained for this study indicates that Latest Pleistocene alluvial deposits in the Sacramento Valley are also more than 13,000 years old (Beta-233072).

In the Sacramento Valley, a large alluvial fan was deposited along the west side of the Feather River extending to the base of the Sutter Buttes (see Figure 47). Just to the north, a distal fan or basin-floodplain was deposited in the Llano Seco area (see Figure 43), possibly from the Stony Creek fan. Smaller fans formed near the base of the Cascade and Coast ranges and on the fringes of the Sutter Buttes (see Figure 46). Because the Stony Creek fan once extended farther to the east, it appears that the main channel of the Sacramento River was forced to flow eastward around the distal fan and possibly around the eastern side of the Llano Seco area during the latest Pleistocene. If so, this may partly explain the subsequent formation of paleochannels in that area (see Figure 10). Isolated Latest Pleistocene deposits also occur along the south sides of the American River and Bear River, drainages that were glaciated (see Figure 47). That these floodplain-terraces are set into older Pleistocene deposits indicates that substantial erosion created terrace escarpments along the base of the Sierra Nevada prior to, or at the beginning of, the latest Pleistocene (~22,000 cal BP). The lack of surface exposure along other Sierra rivers implies that deglaciation after 22,000 cal BP left few recognizable signatures in the modern landscape, other than erosional cuts. It is likely that some Latest Pleistocene surface deposits in the upper reaches of Sierra rivers were removed by historic-period mining and by erosion during the Holocene. However, these surfaces are likely buried beneath younger alluvial deposits farther down-channel in the lower Sacramento Valley.

Early Holocene

During the environmental transition from the Pleistocene to Holocene, a series of small to moderate sized alluvial fans and floodplains were deposited in the lowlands along the west side of the Sacramento Valley; marked by soils of the Tehama and Rincon series (see Early Holocene map unit; see Figure 47). These fans and floodplains are often set into Older Pleistocene deposits, creating a distinct terrace sequence, and evincing a period of fan and floodplain erosion during the latest Pleistocene. Radiocarbon dates from District 3 indicate that deposition of the early Holocene unit on the western side of the Sacramento Valley began during the Younger Dryas, around 12,000 cal BP (OS-62975), but ceased before 10,600 cal BP (OS-63029), marking the stratigraphic boundary between the latest Pleistocene and Holocene. The timing of this event, and position at the base of the Coast Ranges, suggest that deposition at the Pleistocene-Holocene transition must represent a geomorphic response to climatically driven environmental changes that were unrelated to glaciation or deglaciation. No comparable depositional unit was identified at the surface along the base of the Sierra Nevada, on the eastern side of the Sacramento Valley. The absence of these alluvial landforms may imply that no deposition occurred during this interval or that these deposits were removed by subsequent erosion. However, stratigraphic evidence from the Sacramento Valley indicates that early Holocene surfaces now lie buried beneath younger Holocene fans and floodplains (Figure 54). Higher in the Sierra Nevada around Lake Tahoe, it appears that a few moderately sloping floodplain-terraces were also deposited around this time (Christofer-Gefo series soil), though these have not been directly dated.

Middle Holocene

Because middle Holocene-age landforms are rarely preserved at the surface in central California, the nature and extent of landscape changes during this interval are somewhat ambiguous. Nevertheless, middle Holocene-age depositional landforms were identified and mapped in a few parts of the Sacramento Valley, representing alluvial fans, flood-basins, and floodplains. These landforms generally occupy an intermediate position between early Holocene deposits, and those mapped as late Holocene. As currently expressed at the

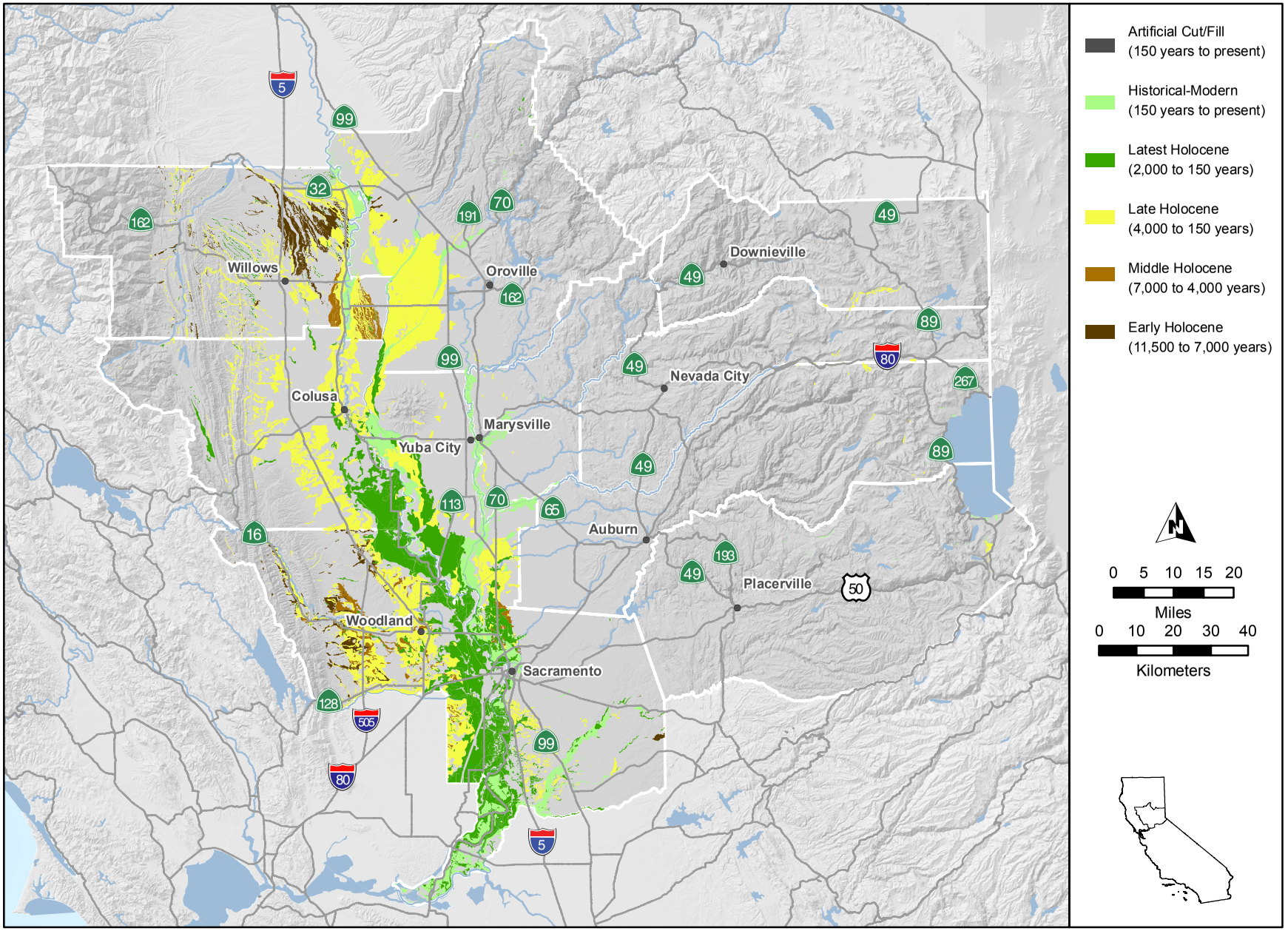


Figure 54. Holocene-Age Surface Deposits that Contain or Overlie Buried Soils in District 3.

surface, middle Holocene-age landforms occur primarily in the western Sacramento Valley between Glenn and Yolo counties, with the largest and most continuous deposits found on the Stony Creek fan (see Figure 47). Sand blown from abandoned channels of Stony Creek during the middle Holocene form a pair of small, but relatively continuous dune ridges marked by the Jacinto-series soil (see Figure 50). East of the Sacramento River, a floodplain was deposited along the southwestern edge of the Llano Seco area during the middle Holocene (see Figure 43), and isolated floodplains were formed within some small unglaciated drainages that were incised into Older Pleistocene landforms (e.g., Hicksville-series soil in Sacramento County). Middle Holocene deposits also form small alluvial fans and isolated terraces in a few upland valleys, such as Long Valley and Sierra Valley in the eastern Sierra Nevada.

The occurrence of middle Holocene-age buried soils throughout central California suggests this interval was primarily marked by stability, and that these landforms tended to occupy relatively low landscape positions that became loci for sediment deposition during the late Holocene (e.g., distal fans, inset terraces, natural levees, and the American River floodplain-terrace; see Figure 54).

Late Holocene

After 4,000 years ago, large amounts of alluvium were deposited across most of the Sacramento Valley, and within many of the smaller valleys and drainages of the Coast Range. Late Holocene alluvial deposits occur along most streams and rivers in District 3, and coalesce to form the floor of many smaller valleys, including several in the eastern Sierras (see Figure 47). In the Sacramento Valley, these deposits form a nearly continuous unit that extends from southern Glenn County through Yolo County on the western side and from northern Butte County to southern Sutter County on the eastern side. The presence of late Holocene deposits in both large and small drainages is significant because it indicates that deposition occurred throughout the region at about the same time, and that the spatial extent of this depositional episode equaled or exceeded that associated with Pleistocene glacial cycles.

The nature and distribution of late Holocene landforms indicate that they were once more extensive, but were partially eroded and/or buried by latest Holocene or Historical deposits, primarily along modern streams and rivers in the lower Sacramento Valley (see Figure 54). The late Holocene unit often overlies at least one older land surface (i.e., buried soil), which sometimes harbors buried archaeological deposits (e.g., site COL-247, Upper Freshwater Site, Lamb Valley Site). As one or more buried soils are often found within the unit, it appears that more than one major depositional episode was responsible for the formation of the late Holocene deposits.

Latest Holocene

Within the past 2,000 years, a sizable body of alluvium was deposited across the central part of the lower Sacramento Valley, and in the narrow valleys along most rivers and streams draining the Coast and Sierra-Cascade ranges. These latest Holocene deposits form a nearly continuous belt of alluvium on either side of the Sacramento River channel, broad basins and floodplains in the lower Sacramento Valley, and marshes in the Delta region (see Figure 47). This depositional unit also forms the surface of many floodplains and marshes located in the Sierra uplands. While the presence of latest Holocene deposits in both large and small drainages indicates that deposition occurred at about the same time throughout the region, the extent of this deposition did not equal that of the late Holocene unit.

The nature and distribution of the latest Holocene landforms indicate that they were once more extensive, but were partially mined, eroded, and/or buried by younger deposits, primarily along the glaciated drainages in the lower Sacramento Valley (see Figure 54). Like the late Holocene unit, latest Holocene landforms often contain one or more buried soils dating to at least 700 cal BP, but generally no more than 2100 cal BP. This suggests that multiple depositional episodes were responsible for the formation of the latest Holocene landforms during the last 2,000 years.

Historical to Modern

The last major phase of landscape development occurred in response to changing land use, hydrology, and vegetation patterns associated with the historical and modern eras. The most influential of these was the

hydraulic and dredging methods used to mine and extract gold from the upper and lower Sierra Nevada. In the late 1800s, a great deal of the sediment generated by these activities poured into nearby drainages and onto the floor of the Sacramento Valley, where it filled most of the major river channels and caused extensive flooding of the lowlands (see *Historic-Period Flooding and Deposition* on page 18). Consequently, deposits assigned to the historical and modern group are largely restricted to the floodplains of glaciated drainages and the active floodplains of modern stream and river channels, such as the lower Feather River, and within the Delta region (see Figure 47). The historical to modern map group also includes areas that were artificially cut and/or filled as a result of mining, construction, or urban development; thus, the unit is still being formed.

Archaeological Implications of Landscape Change

While a large part of the pre-Holocene landscape in District 3 has remained relatively stable since people first arrived more than 13,000 years ago, many portions were removed by erosion (mainly uplands) while others were buried by sediments (mainly lowlands). The Holocene stratigraphic record is characterized by multiple cycles of land stability and instability in which relatively long stable periods (i.e., soil formation) were interrupted by short episodes of sediment deposition. The sequence of landscape changes identified by this study suggests that large-scale episodes of deposition took place around 12,000, 7,000, 4,000, 2,000, and 150 years ago, while the intervening periods were ones dominated by landform stability that permitted human use and occupation. As a result, these changes buried many of the older landscapes along with any associated archaeological sites.

Given the timing and magnitude of these changes, the present landscape is at best an indirect and imperfect reflection of the environment used by people during the prehistoric and even historic period eras. Because the region's landscape has changed so dramatically since the arrival of people, an intimate link should exist between the human past, landscape evolution, and the resulting structure of the archaeological record. Because the majority of the alluvium on the Sacramento Valley floor appears to be late or latest Holocene in age, it need not be surprising that a substantial and conceivably important part of the "pre-late Holocene" archaeological record lies buried beneath these depositional landforms. The archaeological implications of these changes are explored further in Chapter 5.

CHAPTER 5: GEOARCHAEOLOGICAL ASSESSMENT OF DISTRICT 3

The following section interprets the record of human occupation in District 3 from the perspective of the landscape. This review is designed to provide a better understanding of how latest Pleistocene and Holocene landscape changes affected the nature and visibility of the archaeological record. Episodes of deposition, erosion, and stability have all modified the archeological record in the same way that they have transformed the geomorphic landscape. To understand the way in which the archaeological record has been structured, therefore, is to understand the way in which the landscape has evolved during the Holocene. To illustrate this relationship, our discussion begins with an analysis of radiocarbon and obsidian hydration information from 147 archaeological sites located in various geomorphic contexts across District 3, from the uplands of the Sierra-Cascade and Coast ranges to the Sacramento Valley floor. This analysis reveals a strong bias in the regional sample toward late Holocene archaeological deposits from late Holocene geological contexts. It also shows that older segments of the archaeological record are indeed preserved in older geomorphic contexts. However, as there is scant evidence of late Pleistocene and early to middle Holocene human occupation in the study area, this review focuses on the geological context of these deposits to illuminate where missing and otherwise under-represented segments of the archaeological record might be located in District 3. Lastly, the distribution and context of late Holocene-age buried sites in central California is described, revealing that even archaeological deposits from the most recent time periods are under-represented in the regional surface sample.

THE ANTIQUITY AND CONTEXT OF THE ARCHAEOLOGICAL RECORD IN DISTRICT 3: RADIOCARBON AND OBSIDIAN HYDRATION EVIDENCE

Radiocarbon Dates

Archaeologists working throughout central California have long recognized that relatively recent changes to the geomorphic landscape may have imposed a significant bias on the archaeological record, primarily in the lowland valleys (Heizer 1949, 1950a, 1950b, 1952:9; Heizer and Cook 1953; Lillard et al. 1939:76; Meighan 1965:709; Moratto 1984:214; Schenck and Dawson 1929:294). In particular, archaeological sites more than a few thousand years old are substantially under-represented in the regional sample. This bias is best illustrated through an examination of all cultural radiocarbon dates from the District 3 study area (Figure 55). Two hundred and forty-seven radiocarbon dates are available from 61 sites, yet only two of these dates exceed 4,800 years old. The oldest cultural radiocarbon date (8570 cal BP) from the study area comes from an elk bone at GLE-105, a deposit thought to date primarily to the Middle Period of the late Holocene (Bayham and Johnson 1990). Three other dates from that site are considerably younger, ranging between 2100 and 2600 cal BP. The disparity in dates at GLE-105 led Bayham and Johnson (1990) to reject the older date as non-cultural. The second oldest date from the study area (5850 cal BP) comes from unassociated charcoal recovered in near-surface contexts at PLA-5 in the Martis Valley. Due to a questionable association with the cultural deposit, this date too remains suspect. Thus, we are left with a radiocarbon record of human occupation in District 3 that begins at the very end of the middle Holocene. Of the other 245 dates, 91% (n=223) are less than 3,000 years old, and 82% (n=202) are less than 2,000 years old, clearly reflecting an overabundance of dates from the latest Holocene.

In the Sacramento Valley (portions of Butte, Colusa, Glenn, Sacramento, Sutter, Yolo, and Yuba counties), the under-representation of archaeological deposits from the early and middle Holocene appears to be related, in part, to the age of sampled geological contexts (Table 20). Just over 90% of the 177 radiocarbon dates from the valley are less than 3,000 years old. Two-thirds (69%, n=122) of these dates, and almost two-thirds of the dated sites (64%, n=23), are associated with late Holocene surface landforms (Late Holocene, Latest Holocene, and Historical). These patterns clearly show that radiocarbon sampling in the valley has been biased toward geological contexts less than 4,000 years old, contexts which have no potential to contain surface archaeological deposits from the middle and early Holocene.

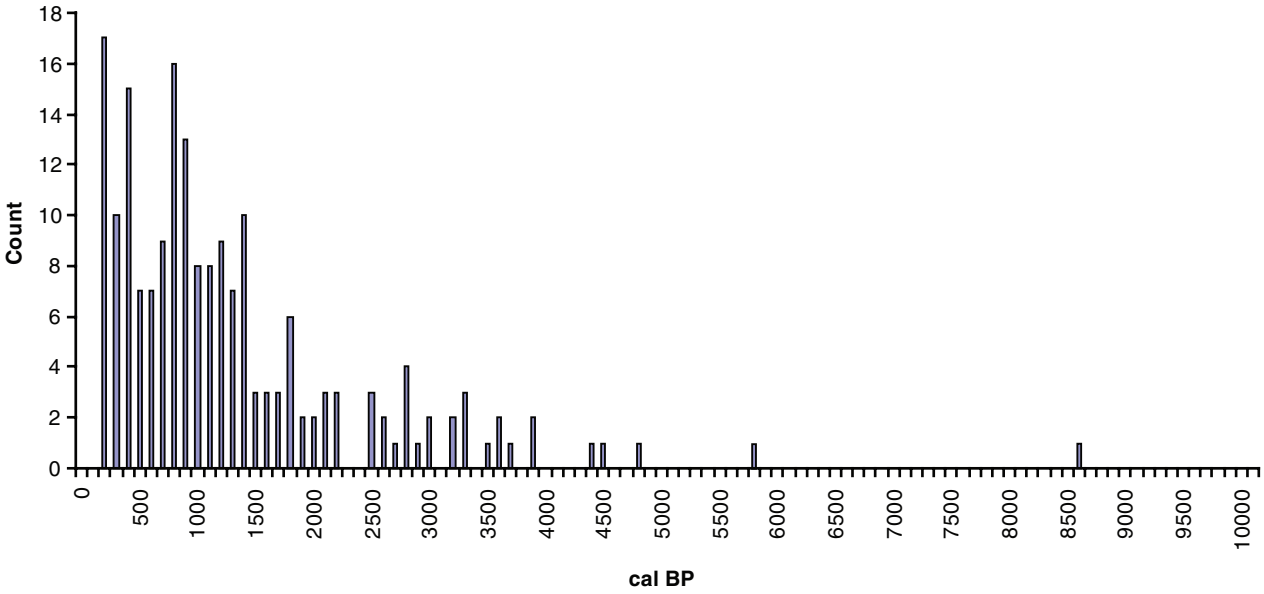


Figure 55. Cultural Radiocarbon Dates from District 3.

Table 20. Number of Radiocarbon Dates from Sacramento Valley Sites by Landform Age.

Site	Early-Late Pleistocene	Latest Pleistocene	Early Holocene	Late Holocene	Latest Holocene	Historical to Modern
SAC-151	-	-	-	-	-	1
SAC-168B	-	-	-	-	-	1
SAC-205	-	-	-	-	-	1
SAC-029	-	-	-	-	1	-
SAC-065	-	-	-	-	1	-
COL-245/H	-	-	-	-	2	-
SAC-034	-	-	-	-	2	-
SAC-329	-	-	-	-	3	-
COL-158	-	-	-	-	4	-
YOL-182	-	-	-	-	4	-
BUT-233	-	-	-	-	5	-
SAC-042	-	-	-	-	5	-
BUT-496	-	-	-	-	9	-
YOL-013	-	-	-	-	9	-
YOL-197	-	-	-	-	9	-
SAC-043	-	-	-	-	22	-
YOL-069	-	-	-	-	23	-
Freshwater Site	-	-	-	1	-	-
GLE-105	-	-	-	1	-	-
YUB-1157	-	-	-	1	-	-
YOL-187	-	-	-	4	-	-
BUT-294	-	-	-	5	-	-
COL-247	-	-	-	8	-	-
Chickahominy Site	-	-	1	-	-	-
YOL-110	-	-	1	-	-	-
GLE-105	-	-	3	-	-	-
GLE-217	-	-	4	-	-	-
SAC-157	-	4	-	-	-	-
SAC-021	7	-	-	-	-	-
SAC-060	3	-	-	-	-	-
SAC-099	4	-	-	-	-	-
SAC-107	2	-	-	-	-	-
SAC-133	6	-	-	-	-	-
SAC-145	8	-	-	-	-	-
SAC-267	10	-	-	-	-	-
Total Dates	42	4	9	20	99	3
Total Sites	7	1	4	6	14	3

All 14 dates from the Sacramento Valley exceeding 3000 cal BP are from older landform contexts (>4000 cal BP). Nine dates (64%) from five sites are associated with buried land surfaces (i.e., buried soils) beneath Late and Latest Holocene floodplains, while five dates from four sites were obtained from surface landforms dating to the Pleistocene and Early Holocene. The latter finding is significant, as 30% of the 13 surface sites sampled on older landforms produced dates greater than 3,000 years; and all of the sites older than this date associated with Late Holocene landforms are from buried deposits. This observation is consistent with other evidence for widespread episodes of late Holocene deposition after 3000 cal BP (see Chapter 4). These patterns also indicate that site deposits greater than 3,000 years old make up more than one-quarter of those sampled on older surface landforms in the Sacramento Valley.

The situation is somewhat different in the uplands of the Coast and Sierra-Cascade ranges (in portions of El Dorado, Placer, Nevada, Yuba, Butte, Glenn, and Colusa counties) where pre-Holocene surface landforms are mapped over the vast majority of the landscape. In these regions, 97% (n=68) of the radiocarbon dates from 96% (n=24) of the sites come from landforms mapped as pre-Holocene (Early to Latest Pleistocene and Pre-Pleistocene; Table 21). In all, 15% (n=10) of the total dates are greater than 3,000 years old, and 34% (n=23) are greater than 2,000 years old. These values compare to just 9% and 18%, respectively, from the Sacramento Valley. More importantly, 28% (n=7) of the total upland sites (n=25) generated dates older than 3000 cal BP, compared to just 11% in the lowlands. Thus, older sites are better represented overall in the upland sample, a finding consistent with the much more extensive exposure of older surface landforms in the Coast and Sierra-Cascade ranges.

Table 21. Radiocarbon Dates from Upland Sites by Landform Age.

Site	Pre-Pleistocene	Early-Late Pleistocene	Latest Pleistocene	Late Holocene
NEV-013/H	-	-	-	2
ELD-044	-	-	1	-
P-05-19-000795	-	-	2	-
PLA-163	-	-	2	-
PLA-165	-	-	3	-
NEV-120	-	1	-	-
NEV-199	-	6	-	-
PLA-005	-	10	-	-
BUT-084	2	-	-	-
BUT-131	2	-	-	-
BUT-157	4	-	-	-
BUT-182	1	-	-	-
COL-011	1	-	-	-
COL-037	1	-	-	-
COL-081	1	-	-	-
ELD-201	1	-	-	-
ELD-616/H	2	-	-	-
NEV-015	3	-	-	-
NEV-194	2	-	-	-
NEV-407	5	-	-	-
PLA-006	2	-	-	-
PLA-101	3	-	-	-
PLA-272	3	-	-	-
PLA-695/H	6	-	-	-
PLA-728/H	4	-	-	-
Total Dates	43	17	8	2
Total Sites	17	3	4	1

More importantly, however, the proportion of upland sites with dates older than 3000 cal BP is nearly identical to the proportion found on older surfaces in the Sacramento Valley (28% vs. 30%). Similar proportions of older sites are also found in buried geological contexts. Of the 29 radiocarbon dates from buried site components in the valley, 30% (n=9) are greater than 3000 cal BP. More to the point, 38% (n=5) of the 13 buried site components produced dates older than 3000 cal BP. These comparisons indicate that archaeological deposits more than 3,000 years old are between 28 and 30% more common on older surface landforms and 38% more common in buried contexts. It is also apparent that older deposits are under-represented by at least one-third on late Holocene surface landforms (i.e., <4000 cal BP).

This latter finding is reinforced through an examination of all natural and cultural radiocarbon dates from surface and buried contexts in District 3 (Figure 56). Although, archaeological deposits older than 4800 cal BP have not been identified in the study area, as shown in Figure 56, there are numerous dates from natural contexts

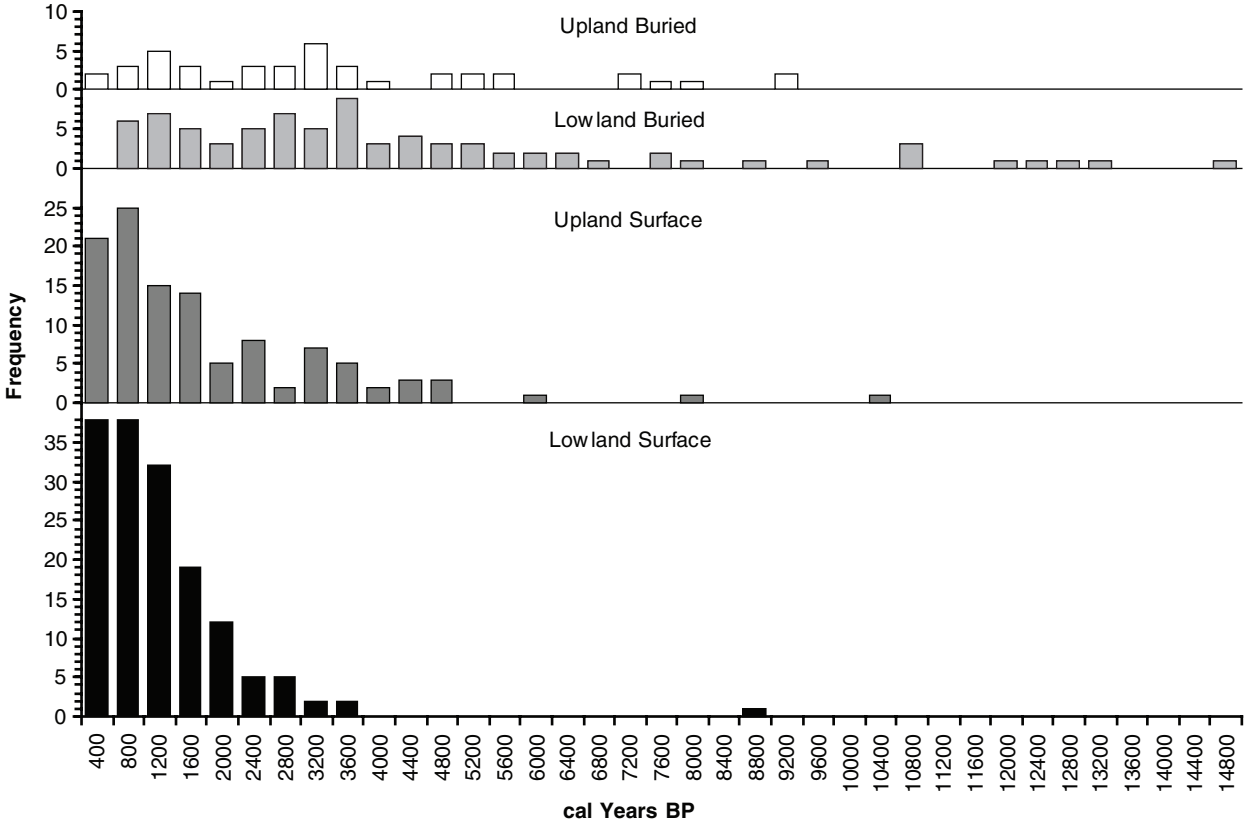


Figure 56. Age and Frequency of Radiocarbon Dates from Upland and Lowland Contexts in District 3.

in District 3 that fall within the middle and early Holocene. Both natural and cultural dates from surface contexts are confined mainly to the late Holocene; however, dates associated with buried soils span the latest Pleistocene through latest Holocene, from about 13,000 to 200 cal BP (Figure 57). Most cultural dates from buried contexts form two clusters in the late Holocene, 3600 to 2600 cal BP and 1600 to 600 cal BP (Figure 57). The age and frequency of dates from buried soils reinforce the notion that late Holocene sediment deposition buried large portions of the central California landscape and therefore had a similar effect on associated archaeological deposits.

Obsidian Hydration Readings

The near absence of radiocarbon-dated sites greater than 4800 cal BP in the District 3 sample remains a problem as the broad expanse of old land surfaces in both the uplands and lowlands should contain older portions of the archaeological record. However, when obsidian hydration information from this region is evaluated, evidence for early and middle Holocene (>4000 cal BP) human occupation can easily be detected. Comparison of 3,911 obsidian hydration values from 88 archaeological sites throughout high and low elevation regions of District 3 reveals a comparatively high number of readings exceeding 6.0 microns (Figure 58). Three source materials make up the vast majority (73%) of the total obsidian sample: Napa Valley (n=1,258), Bodie Hills (n=1,084), and Borax Lake (n=529; see late Holocene *Human Occupation* on page 66 for geographic distributions). Converted to calibrated radiocarbon years, a reading of 6.0 microns is equivalent to 5500 cal BP, Napa Valley (Origer 1982); 5100 cal BP, Bodie Hills (Rosenthal and Meyer 2004c); and 4200 cal BP, Borax Lake (White et al. 2002). Although the hydration sample, like the radiocarbon sample, is strongly weighted toward the late Holocene, hydration readings from the early and middle Holocene (i.e.>6.0 microns) make up 8% of the lowland sample and 11% of the upland sample.

When the three primary obsidian types are divided by sub-region (Table 22), there appears to be very little difference in the average age of the Bodie Hills and Borax Lake obsidian, suggesting that access and use of these materials was similar over time between the Coast Ranges, Sacramento Valley, and Sierra-Cascade Range. However, substantial differences are revealed in the sample of Napa Valley obsidian (Table 22). Readings from the Coast Range and Sierra-Cascade uplands average 1.8 and 2.2 microns larger, respectively, than the Sacramento Valley sample. Using Origer's (1982) Napa Valley hydration rate, the Sierra mean of 4.7 microns translates to an average age of 3390 cal BP, while the Sacramento Valley mean of 2.2 microns corresponds to an age estimate of just 740 cal BP. That the average Napa reading from the Sierra is more than 2,000 years older than that from the valley suggests that Napa was carried farther to the east during the early and middle Holocene than it was during the late Holocene. The thicker average Napa reading from the Coast Ranges may suggest that it was also carried farther north. Temperature differences do not appear to explain the more frequent older readings in the uplands, as colder temperatures in these settings are expected to inhibit the hydration process (i.e., make it slower), whereas warmer valley temperatures are expected to speed it up.

While the regional data reveal that the Sacramento Valley sample is overwhelmed by Napa obsidian deposited during the latest Holocene (i.e., 740 cal BP), average Bodie Hills and Borax Lake readings from both the uplands and lowlands suggest that use of these materials peaked more than 1,000 years earlier. Average Bodie Hills values from the Sacramento Valley and Sierra-Cascade Range calibrate between 1800 (3.8 microns) and 1920 (3.9 microns) cal BP, while average Borax Lake readings from the same localities calibrate between 2400 (4.9 microns) and 2015 (4.6 microns) cal BP, respectively. The sample of Borax Lake from the Coast Ranges averages the thickest (5.1 microns), calibrating to a mean age of 2685 cal BP.

Table 22. Obsidian Hydration Readings by Geographic Sub-Region.

SOURCE:	BODIE HILLS			BORAX LAKE			NAPA VALLEY		
	MEAN (μ)	RANGE (μ)	COUNT	MEAN (μ)	RANGE (μ)	COUNT	MEAN (μ)	RANGE (μ)	COUNT
Coast Range	-	-	-	5.1	0.9-10.6	213	4.3	1.2-11.3	78
Sacramento Valley	3.8	1.8-6.6	23	4.9	0.9-11.0	243	2.5	0.7-14.8	818
Sierra-Cascade	3.9	0.7-12.3	1061	4.6	0.9-11.0	74	4.7	1.0-12.0	358

Notes: μ – Microns.

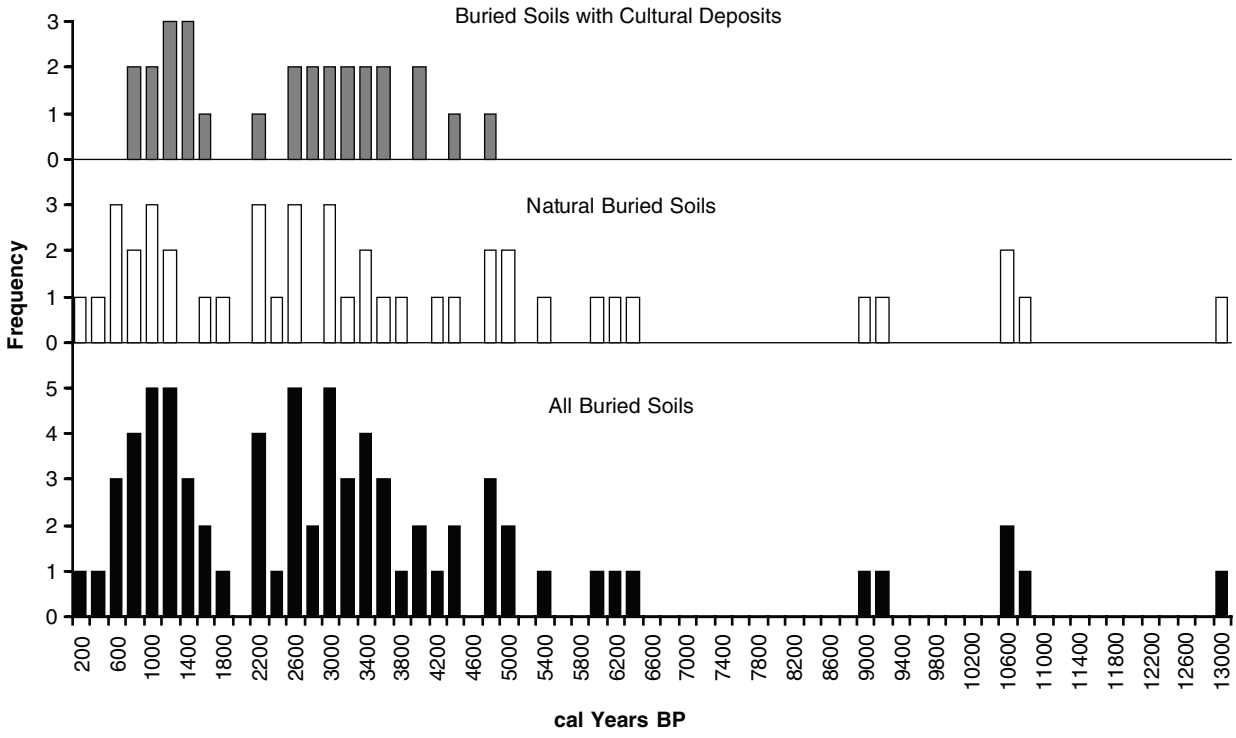


Figure 57. Age and Frequency of Radiocarbon Dates from Buried Soils in District 3.

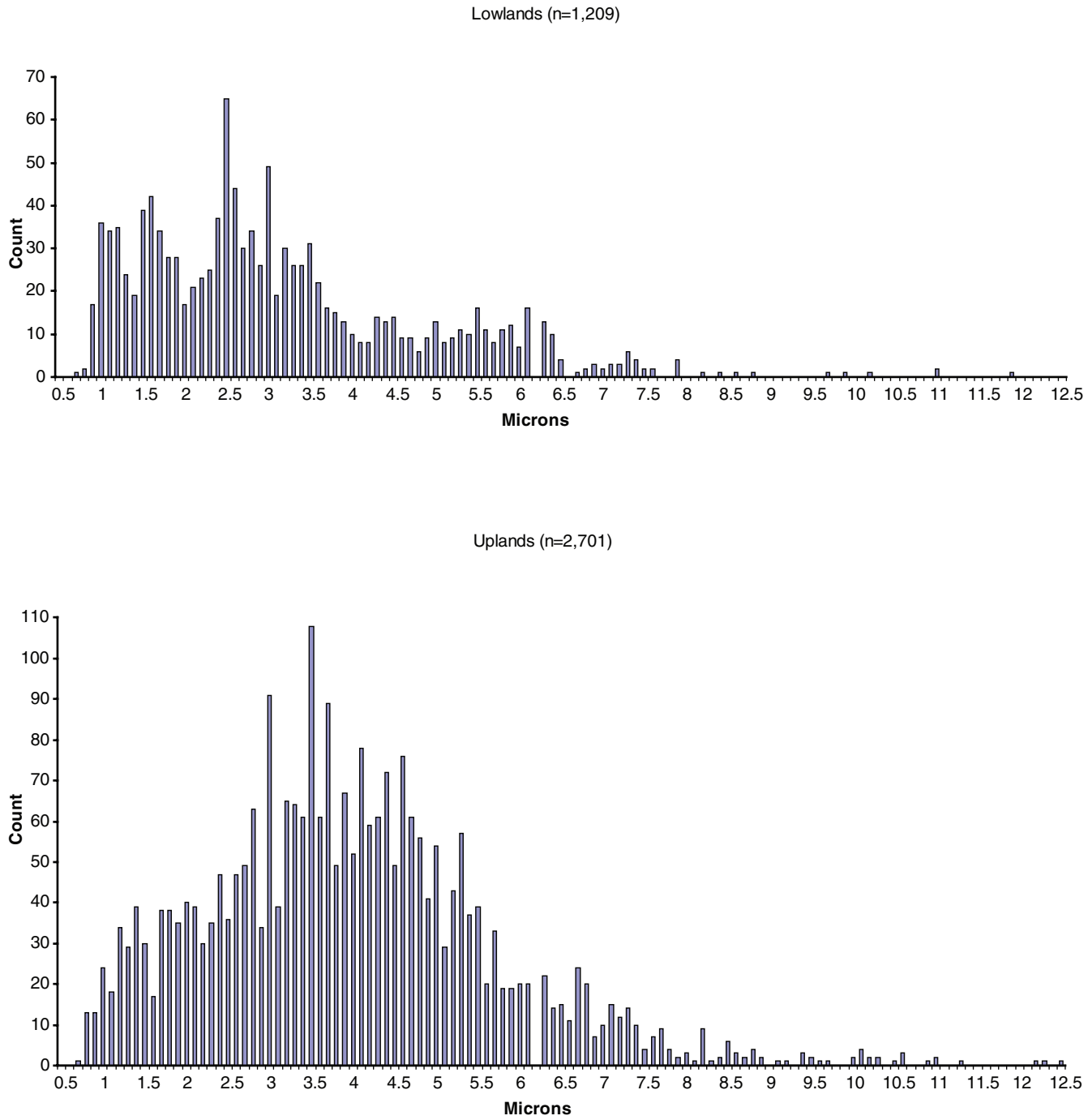


Figure 58. All Obsidian Hydration Readings from Upland and Lowland Contexts in District 3.

Differences in the age of the three main obsidian sources by sub-region reveal a dynamic history of land use and exchange in central California (Jackson 1974). However, the over-abundance of late Holocene hydration readings in the Sacramento Valley can partially be explained with reference to the geological context of the samples. Like the radiocarbon dates, the majority of obsidian hydration readings from the valley originate from geological contexts less than 4,000 years old. In all, 62% of the hydration readings (n=748) from 67% of the sites (n=20) are from late or latest Holocene landforms. The influence of this sampling bias is clearly seen when the hydration results are divided by landform age. As indicated in Table 23, average Napa hydration readings from Early Holocene and Pre-Holocene surface landforms are more than one-micron thicker than the average reading from Late Holocene surface landforms (Table 23). An even greater difference is seen among the samples of Borax Lake obsidian (Table 23); readings associated with Early Holocene surface landforms average 2.0 microns larger than those from Late Holocene surface contexts. Likewise, samples of Napa Valley and Borax Lake obsidian from buried contexts in the Sacramento Valley average between 0.5 and 0.2 microns thicker, respectively, than late Holocene surface samples (Table 23). The very small sample of Bodie Hills obsidian reveals the same patterns (Table 23).

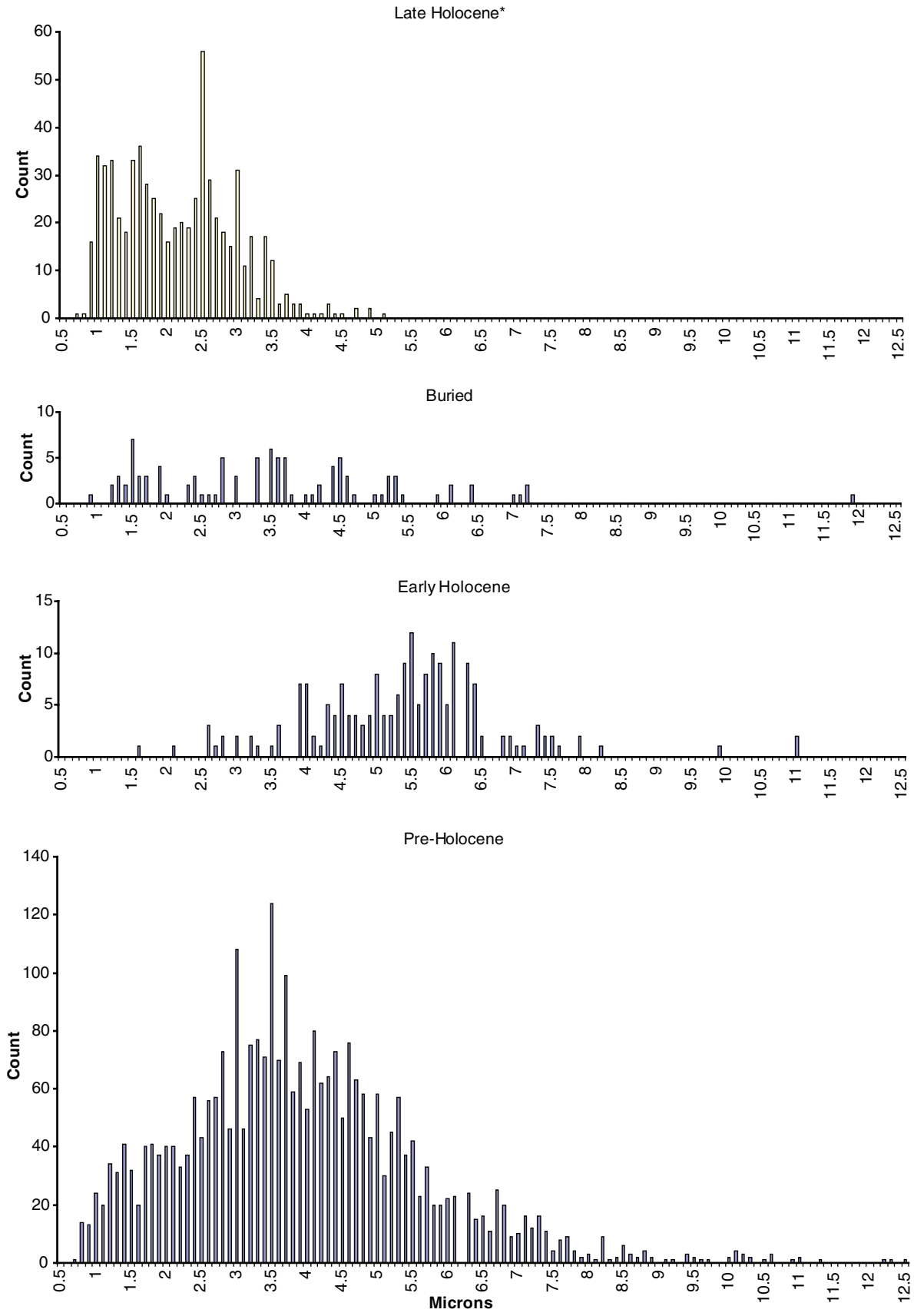
Table 23. Obsidian Hydration Readings by Geological Context in the Sacramento Valley.

SOURCE:	BODIE HILLS			BORAX LAKE			NAPA VALLEY		
	MEAN (µ)	RANGE (µ)	COUNT	MEAN (µ)	RANGE (µ)	COUNT	MEAN (µ)	RANGE (µ)	COUNT
Late Holocene, Surface	3.3	1.9-4.3	9	3.4	0.9-8.7	29	2.2	0.7-9.6	592
Late Holocene, Buried	5.0	-	1	3.6	0.9-7.0	30	2.8	1.2-5.2	26
Early Holocene, Surface	4.7	-	1	5.4	1.6-11.0	183	3.8	2.1-6.0	10
Pre-Holocene, Lowland	4.1	1.8-6.6	12	7.3	-	1	3.4	0.8-10.2	190

The relationship between landform age and the age of associated archaeological deposits is also clearly expressed with reference to the total hydration readings from various upland and lowland geological contexts. Overall, only about 3% (n=20) of all hydration readings from late Holocene (Latest Holocene, Late Holocene, and Historical) surface landforms equal or exceed 4.0 microns (Figure 59), roughly 2500 cal BP according to Origer's (1982) Napa rate, and 1360 cal BP according to White et al.'s (2002) Borax Lake rate. These results are largely consistent with the age of Late and Latest Holocene landforms determined through radiocarbon dating (i.e., less than 4,000 years old; see Chapter 4). Only two sites (BUT-1123 and SUT-17) from surface landforms in the valley mapped as Late Holocene generated multiple readings greater than 5.2 microns (i.e., 4030 cal BP, Napa Valley or 2830 cal BP Borax Lake). As discussed more fully below (see *Landscape Evolution and the Archaeological Record* on page 144), at least one of these sites (BUT-1123) was probably originally buried and exposed during levee construction or is associated with a Pre-Holocene surface, contrary to the current mapping; all six readings from this site exceed 7.0 microns. The second site, SUT-17, was re-examined as part of this study and found to contain an early Holocene or pre-Holocene buried soil. Two stratigraphic components are clearly present in the hydration sample from SUT-17 (Bouey et al. 1993). The younger component comes from near surface contexts (0-40 centimeters) and produced a hydration mean of 1.4 microns (Napa Valley; range=1.2-1.7 microns; n=5). Napa Valley hydration readings from the deeper component (40-180 centimeters) average 5.6 microns (range=2.8-14.8 microns; n=7) and are probably associated with the buried pre-Holocene soil.

In contrast to the sample from Late Holocene surface landforms, combined hydration results from buried deposits extend well beyond 4.0 microns, with roughly 39% of the total readings (n=61) exceeding this value (Figure 59), including multiple readings from three of the four buried sites. The middle and early Holocene is reasonably well represented in the buried sample with 10% of the total readings falling between 5.9 and 7.5 microns (7.5 microns=8630 cal BP, Napa; 7870 cal BP, Borax Lake).

A large proportion of readings from Early Holocene surface landforms in the valley also appears to be middle Holocene in age (i.e., between 5.9 and 7.5 microns, Borax Lake), while readings characteristic of the latest Pleistocene and early Holocene (i.e., >7.5 microns) are confined mainly to Pre-Holocene landforms from both the valley and uplands (Figure 59). In these latter contexts, between 39 and 60% of the sampled sites generate multiple hydration readings of 6.0 microns or larger (Table 24). These patterns clearly show that a relatively broad distribution of archaeological deposits dating to the early Holocene and beginning of the middle Holocene occurs on older surface landforms in District 3.



(*Note: Excludes statistical outliers from, SAC-42, SAC-43, BUT-496 and readings from BUT-1123 and SUT-17)

Figure 59. All Obsidian Hydration Readings by Geological Context in District 3.

Table 24. Obsidian Hydration Readings Equal or Greater than 6.0 Microns by Geological Context.

Context	# of readings [a]	# of sites	# of readings ≥6.0μ		# of sites with readings ≥6.0μ [b]	
			Count	Percent	Count	Percent
All Uplands	1784	56	261	0.15	22	0.39
Pre-Holocene, Lowlands	203	5	16	0.08	3	0.60
Early Holocene, Lowlands	195	3	54	0.28	1	0.33
Buried, Lowlands	61	4	6	0.10	2	0.50
Late Holocene, Lowlands	631	15	16	0.03	2	0.13

Notes: [a] Includes only Bodie Hills, Borax Lake, and Napa Valley obsidian; [b] Samples with only one reading of 6.0μ or greater excluded

Summary and Discussion

Analysis of radiocarbon and obsidian hydration information by geological context clearly shows that samples from the Sacramento Valley are heavily biased toward late Holocene surface landforms. Two-thirds or more of the archaeological sites from the valley with radiocarbon dates and/or obsidian hydration readings originate from contexts less than 4,000 years old, heavily skewing the archaeological sample toward the late Holocene. However, early and middle Holocene archaeological materials are reasonably well represented in older geological contexts in the Sacramento Valley and uplands of the Coast and Sierra-Cascade ranges. In these settings, one-third or more of the sampled sites contain archaeological deposits older than 3,000 years—a finding illustrated by both the radiocarbon and obsidian hydration samples. These older cultural deposits are buried beneath late Holocene alluvium and are under-represented by at least 30% in the surface sample from the Sacramento Valley.

Although there are broad expanses of pre-Holocene landforms in the valley, the fact that these geomorphic contexts are preserved indicates that they were the most stable and least subject to alluvial deposition and erosion. These landforms survived at the surface because most were far removed from stream and river channels, the source of Holocene deposition and mechanism of greatest erosion. It is in close proximity to water courses, however, that most substantial prehistoric settlements are found. Thus, we believe that the large surface expanses of pre-Holocene landforms which currently exist at the surface in the Sacramento Valley were never very attractive for settlement and probably always had a low site density.

Early and Middle Holocene landforms are quite rare in the modern surface landscape, yet make up a large proportion of identified buried surfaces in the valley. As a result, we believe a substantial proportion of the early and middle Holocene archaeological record is buried in association with buried land surfaces. This is supported by the obsidian hydration record which indicates that 75% of the known buried site components from the Sacramento Valley include multiple hydration values greater than 5.2 microns; that is, greater than 2,800 cal BP using the Borax Lake hydration rate or 4000 cal BP using the Napa hydration rate. A similar pattern is seen in the radiocarbon database, with almost 40% of the dates from buried contexts exceeding 3000 cal BP.

We suspect that the total proportion of older sites in the uplands of the Sierra-Cascade range is also under-represented, but perhaps for slightly different reasons. As shown in the hydration discussion, almost 40% of the upland sites with hydration samples yielded multiple readings falling in the early or middle Holocene (i.e., >6.0 microns). It is commonly the case, however, that upland sites are near-surface deposits and lack suitable material for radiocarbon-dating. Also, many of the upland sites have hydration profiles which suggest that they were repeatedly occupied over very long periods of time. Because obsidian import to the western Sierra was highest during the late Holocene (e.g., Bouey and Basgall 1984; Jackson 1974; King and Hildebrandt 2006), hydration readings from this time period always overwhelm obsidian samples, irrespective of the intensity of occupation. As a result, the combination of few radiocarbon dates and a bias in obsidian discard has likely led archaeologists to under-appreciate the extent of early and middle Holocene archaeological material in the western Sierra (c.f., Elston et al. 1994; Rosenthal 2006; Rosenthal and McGuire 2004).

LANDSCAPE EVOLUTION AND THE ARCHAEOLOGICAL RECORD

Given the extent of Holocene landscape evolution described in the preceding chapter (Chapter 4), it is not surprising that the known record of latest Pleistocene and early Holocene human occupation in central California is sparse. This situation is undoubtedly compounded by lower human population densities and the largely unobtrusive nature of archaeological debris from these earliest time periods. Nevertheless, we suspect that the failure to locate more archaeological components associated with the late Pleistocene and first half of the Holocene is directly related to the inability of archaeologists to identify and sample geological contexts which harbor these remains. The following section examines in more detail the contexts of known early and middle Holocene sites in District 3, as well as those in adjacent portions of the central Sierra and northern San Joaquin Valley where the Quaternary landscape has previously been mapped (Rosenthal and Meyer 2004b). The geological context of late Holocene sites is also examined, focusing primarily on the distribution of buried deposits in both upland and lowland settings (Figure 60).

The Geomorphic Context of Latest Pleistocene and Early Holocene Cultural Deposits (13,500-7000 cal BP)

There are only a hand-full of radiocarbon-dated archaeological sites in central California from the latest Pleistocene or early Holocene, and none are currently reported from District 3 (see Chapter 2). However, where appropriately aged geological contexts exist, evidence for ancient human occupation can be identified, including diagnostic artifacts and large obsidian hydration readings from several sites in the Sacramento Valley and adjacent uplands of the Coast and Sierra-Cascade ranges. Similar evidence has also been reported from pre-Holocene landforms and buried soils in the Northern San Joaquin Valley and adjacent uplands.

Central Valley

Pleistocene-age landforms are surprisingly common in the Sacramento Valley, particularly east of the Sacramento River. These ancient fan remnants extend basin-ward from the Coast Ranges and foothills of the Sierra Nevada. On the east side of the valley along the flanks of the mountain front, Holocene deposition was insufficient to overtake the higher-gradient Pleistocene fans developed from multiple cycles of Sierran outwash. Younger, Holocene-age fans are inset and often blanket only the medial to distal portions of older Riverbank and Modesto formations near the valley floor. As a result, large surficial exposures of these older landforms occur above and below younger alluvial cones and between incised drainages exiting the Sierra and Coast Ranges. In the central portion of the valley, the axial Sacramento and San Joaquin rivers have incised distal Pleistocene fans, developing north-south oriented, Holocene-age floodplains and levee ridges. In some areas of the valley bottom, these younger sediments lap over older floodplains, but in other localities Holocene sediments are inset or have back-filled meander scars and sloughs, leaving discontinuous segments of older landforms exposed at the surface. Not unexpectedly, it is these old fan surfaces on the valley margins and adjacent to the major rivers, which have produced the most ancient archaeological materials thus far reported from the Central Valley proper.

Latest Pleistocene- to early Holocene-age fluted points and eccentric crescents are the most recognizable signature of the valley's earliest human inhabitants. Both artifact types have been recovered from a large peninsula of Riverbank Formation which extends almost to the very eastern edge of the Delta (Atwater 1980) between relatively minor Holocene-age fans of the Mokelumne and Cosumnes rivers. At the distal end of this ancient peninsula, immediately south of District 3, Schenck discovered the basal portion of a Clovis-like projectile point (cf. Heizer 1938). Several decades later, an eccentric crescent was found on this same fan remnant (Beck 1971). Farther south in the San Joaquin Valley, a crescent and two fluted-points were discovered at the Wolfsen Mound (MER-215), located on the distal reaches of a Modesto-age fan emanating from the Diablo Range (Peak and Weber 1978; Rosenthal and Meyer 2004b). On the northwestern edge of the Delta in Solano County, where heavily dissected, Pleistocene alluvial fans extend well into the valley, the base of a fluted-point and several excessively large Napa Valley hydration readings are reported from SOL-347 (Jackson and Simons 1991). Four of five hydration samples from the fluted-point locus returned readings of 7.9, ~8.0, ~8.0, and 18.8 microns.

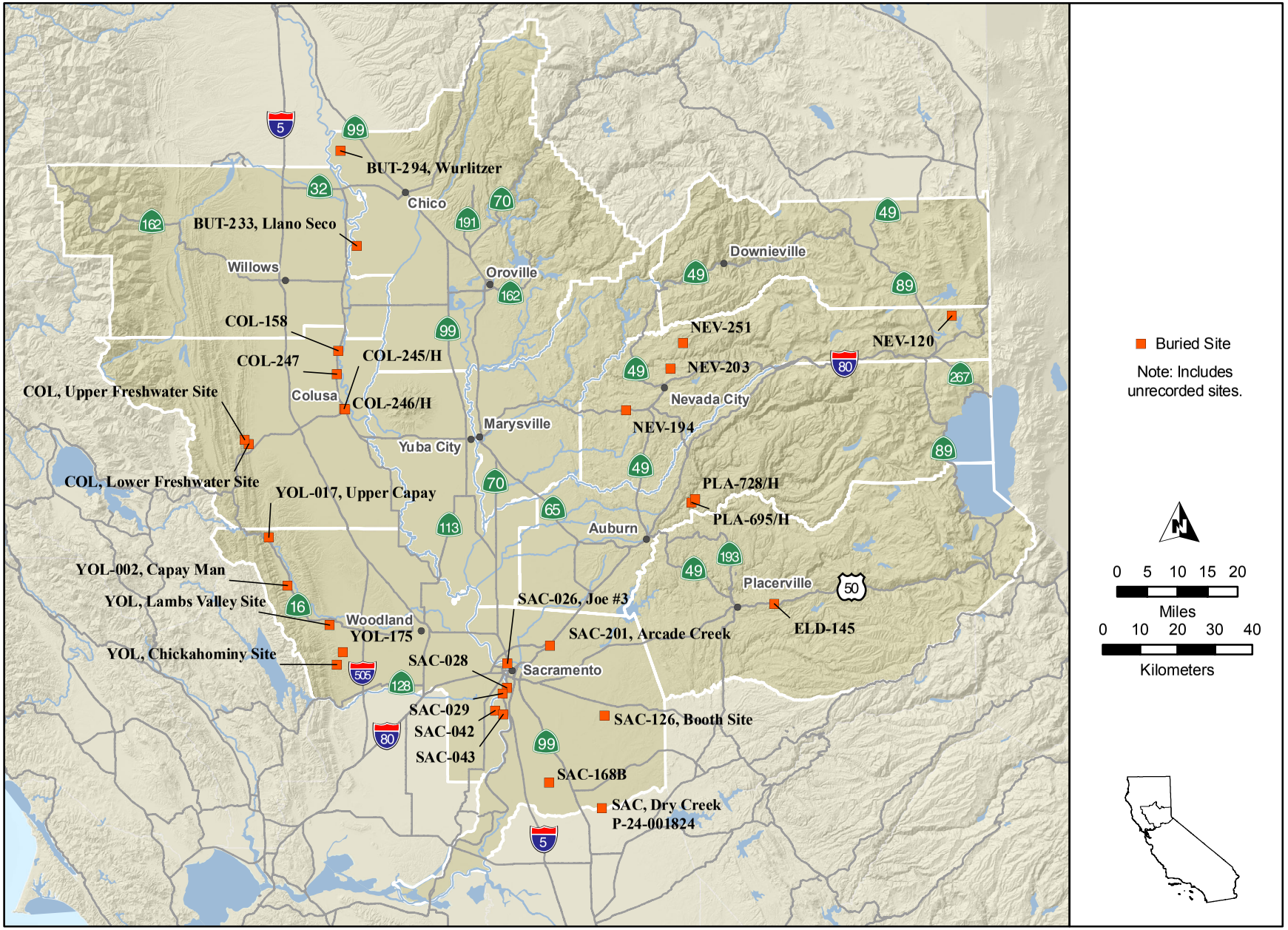


Figure 60. Buried Archaeological Sites and Site Components in District 3.

Within the District 3 study area, in Glenn County, a chert crescent was found on the surface of an older Pleistocene-age fan along Stony Creek, at GLE-306 (Johnson et al. 1984:64). However, one of the oldest cultural deposits from the Sacramento Valley proper was identified within District 3 at BUT-1123 (Bouey et al. 1993). Situated where the Feather River has cut into a Pleistocene fan remnant, all six pieces of obsidian from this site produced readings greater than 7.0 microns, including four pieces of Napa Valley (7.1, 7.2, 7.3, and 8.5 microns) and two pieces of Borax Lake (8.3 and 8.7 microns). Although, current mapping identifies this site as associated with a narrow sliver of Late Holocene alluvium, these hydration readings strongly suggest the site deposit is associated with the adjacent Pleistocene-age surface. A similar situation is reported from MER-118, where an exposed remnant of the Pleistocene landscape adjacent to the San Joaquin River, produced some of the oldest hydration readings from the southern valley. Of the five pieces sampled at MER-118, two Napa Valley specimens returned hydration values of 8.7 and 9.6 microns, respectively, while a third Annadel specimen produced a rim reading of 5.4 microns; two other samples had diffuse hydration bands (Haversat and Breschini 1985:167).

Coast Ranges

The western side of the Coast Ranges is dominated by non-depositional landforms underlain by bedrock. Pleistocene-age alluvial deposits in the uplands commonly exist at the surface as high, dissected terraces, or form coalescing fans along valley margins. However, in the valley bottoms along the east-ward flowing drainages, pre-Holocene and early Holocene land-surfaces are typically buried beneath middle and late Holocene alluvium (see Chapter 5). As a result, evidence for early Holocene human occupation in the Coast Ranges comes from both near-surface and deeply buried contexts.

Although few sites have been excavated in the uplands of the Coast Ranges within District 3, at least two deposits associated with older landforms have produced evidence of early Holocene occupation—COL-76 and -81, sampled by Slaymaker (1983). Site COL-76 is situated on an alluvial terrace along Mill Creek, mapped as pre-Pleistocene. The shallow cultural deposit (<100 centimeters deep) produced as many as four Borax Lake wide-stem points made of local chert, and a high proportion of thick obsidian hydration readings. Although material from later site occupations is present at COL-76, 34% (n=16) of the Borax Lake hydration readings exceed 7.0 microns (ca. 6500 cal BP; White et al. 2002). Site COL-81 is situated on a similar alluvial terrace along Mill Creek and also produced at least one Borax Lake Wide-stem point and a lower, but still significant number of thick Borax Lake hydration readings, with about 11% (n=5) equal to or greater than 7.0 microns.

The only other possible early Holocene deposit from the Coast Ranges in District 3 is the site of Capay Man (YOL-2). This isolated human burial was found in a buried soil along a tributary to Cache Creek in Capay Valley (Heizer and Cook 1953). The Tehama soil series is mapped at the surface of this location and has been dated in nearby drainages to the early Holocene. Although no dates were ever obtained from the Capay burial, its location in or beneath the Tehama soil suggests it could be at least early Holocene in age (c.f., Heizer and Cook 1953).

Other Coast Range Sites

Just west of the District 3 study area, an ancient deposit was found at LAK-1581 on a high, Pleistocene terrace above the confluence of the middle and north forks of Cache Creek (DeGeorgey 2004). Forty-seven Borax Lake obsidian flakes from shallow contexts at LAK-1581 returned a mean hydration band of 7.8 microns and a low standard deviation of just 0.6. These samples provide strong evidence for a single component occupation dating to the latest Pleistocene or early Holocene. On a tributary of Putah Creek, a near-surface rock hearth at LAK-1682 was radiocarbon dated to 8145 cal BP (Rosenthal et al. 1995). This site, associated with an early Holocene floodplain, also produced a Borax Lake Wide-stem point and several large Napa Valley hydration readings, ranging between 6.8 and 9.2 microns (i.e., 13% of the total Napa readings). At the Borax Lake site (LAK-36), Clovis-like fluted-points, chipped stone crescents, and wide-stem points were found incorporated into a middle or late Holocene debris-flow (Meighan and Haynes 1970). Borax Lake obsidian hydration readings from these artifacts ranged between 7.0 and 9.7 microns, with the fluted-points returning a mean of 9.0 microns (White 1999). Elsewhere in the Clear Lake Basin, an extensive period of erosion during the middle Holocene is thought to have obliterated much of the early Holocene archaeological record, particularly on Anderson Flat (White et al. 2002).

In the Coast Ranges south of District 3, early Holocene materials have been found on the surface of Pleistocene-age fans in the small Los Banos Valley in Merced County (Mikkelsen and Hildebrandt 1990). Archaeological sites situated on these Pleistocene-age fans produced several suggestively ancient hydration readings from a small sample of North Coast Ranges and eastern Sierra obsidian sources. Out of 20 hydration samples from 11 sites, eight specimens (40%) returned exceptionally large hydration readings: 9.4 microns (n=2; Casa Diablo); 9.7, 7.6, and 7.5 microns (Bodie Hills); 10.0 microns (Coso); 7.4 microns (Napa Valley); and 5.7 microns (Annadel). In the Kellogg Creek Valley of eastern Contra Costa County, some of the oldest evidence for human occupation in central California was found in association with a deeply buried early Holocene soil at two sites (CCO-696 and -637). Radiocarbon dates associated with human graves and features from these buried deposits range between 9800 and 7200 cal BP (Meyer and Rosenthal 1997, 1998). A Napa Valley obsidian wide-stem point from CCO-696 returned a hydration value of 6.9 microns (Meyer and Rosenthal 1997).

Sierra Nevada

On the western slope of the Sierra Nevada, Pleistocene and pre-Quaternary-age surfaces are quite common and have yielded scattered evidence of ancient human settlement. However, in contrast to the long-term surface exposure of many landforms, cycles of Holocene fan and floodplain deposition have buried portions of the latest Pleistocene and early Holocene landscape in localized, unmapped areas throughout the foothills and western slope of the Sierra. These fans and floodplains incorporate some of the most extensive deposits of early Holocene material in central California.

Within District 3, obsidian hydration information from several sites in Placer County suggests late Pleistocene or early Holocene occupation of the lower foothills (Table 25). Four surface sites near the town of Lincoln (PLA-594/H, -605/H, -606/H, and -627/H), all associated with pre-Holocene landforms, produced very high frequencies of thick Napa Valley and Bodie Hills obsidian hydration readings (Jackson 1996). Overall, between 10 and 18% of the hydration readings from these sites are equivalent to or exceed 7.0 microns (Table 25). At PLA-594, -605, and -606, 17% to 25% of the Napa Valley readings are equal to or greater than 7.0 microns (ca. 7500 cal BP; Origer 1982), while at PLA-606 and -627, 18% and 25% of the Bodie Hills readings, respectively, exceed 7.0 microns (ca. 7300 cal BP; Rosenthal and Meyer 2004c). Delacorte and Basgall (2006), also report similarly high proportions of early Holocene hydration readings from BUT-362/H, situated on a pre-Holocene landform in the foothills at Lake Oroville. In all, 28% of the Napa Valley readings and 19% of the Bodie Hills readings from BUT-362/H are equal to or greater than 7.0 microns (Table 25).

Table 25. Sites with a High Proportion of Early Holocene Hydration Readings, District 3.

Site	Setting	# Readings ≥7.0µ by Source			Total	
		Bodie Hills	Borax Lake	Napa Valley	Count	Percent
BUT-362/H	Foothills	-	4	5	9	13
ELD-145	Upland Forest	20	-	3	23	5
PLA-594/H	Foothills	-	-	3	3	18
PLA-605/H	Foothills	-	-	1	1	11
PLA-606/H	Foothills	3	3	24	30	17
PLA-627/H	Foothills	2	-	-	2	10
PLA-728/H	Upland Forest	6	-	1	7	12

Within the Yellow pine forest on the western slope, high frequencies of early Holocene, Bodie Hills hydration readings are reported from PLA-728. This site, located on a gently sloping landform mapped as pre-Pleistocene, includes two buried soils containing archaeological deposits; the lowest (Layer 4) formed on decomposing shale bedrock (Baker 2000b). Of the 29 Bodie Hills readings from this site, 21% exceed 7.0 microns (Table 25). However, three of nine (33%) hydration samples from the lowest buried soil (Layer 4), returned readings of 10.0, 10.1, and 10.3 microns (Bodie Hills), among the largest grouping of Bodie Hills readings from a single context in central California. If the hydration rate model is correct (Rosenthal and Meyer 2004c), these readings translate to greater than 16,000 cal BP and allude to the presence of a buried component at PLA-728 dating to the latest Pleistocene. At a similar elevation, the stratified site of ELD-145 also contains a

relatively high proportion of early Holocene obsidian, particularly Napa Valley (see Table 25). Although, this site is mapped in association with a pre-Holocene landform, two buried soils containing archaeological material were identified (Jackson and Ballard 1999; Rosenthal 2002), providing further evidence for localized Holocene deposition on pre-Holocene landforms in the western Sierra (e.g., Meyer et al. 1999; Meyer in Rosenthal 2006). Site ELD-145 is dominated by Bodie Hills obsidian from the middle and late Holocene, however, three (see Table 25) of the 12 Napa Valley hydration sample produced rim readings greater than 7.0 microns (i.e., 7.6, 7.6, and 8.1 microns).

In the Tahoe Basin, a number of early Holocene stemmed points have been collected from the surface of pre-Holocene landforms (see Figure 21 and Chapter 2), including those from the Alder Hill and Watson Creek basalt quarries (Bloomer et al. 1997; Duke and Smith 2006; McGuire et al. 2006). However, the best single-component, early Holocene deposit from the basin was identified at the Visitor's Center site (P-05-19-000795) on the southwest shore of Lake Tahoe (Martin 1998). At this site, early Holocene stemmed points and obsidian debitage (mostly un-sourced) with hydration readings averaging 7.0 microns (range=6.0-8.7 microns), were found in a deep deposit of alluvium. Late Holocene radiocarbon dates from the artifact-bearing stratum, however, suggest this old material was redeposited in the last 2,000 years from pre-Holocene surface contexts nearby. Just north of Lake Tahoe, early Holocene materials are associated with a late Pleistocene terrace along the Truckee River, at site NEV-182/H (Lindström et al. 2007). This surface deposit produced a wide array of obsidian sources, with 40% (n=8) of the total readings (n=20) equaling 6.9 microns or greater, including 50% of the Bodie Hills sample (6.9, 8.0, 9.6 microns), 100% of the Casa Diablo sample (6.9, 8.3 microns), 20% of the Mt. Hicks sample (7.1 microns), and 66% of the Sutro sample (7.8, 8.2 microns).

Other Sierra Nevada Sites

Just to the south of District 3, several sites in the western Sierra have produced late Pleistocene and early Holocene artifacts in surface and buried contexts. In the foothills of Amador County, Caltrans archaeologists discovered the base of a Clovis-like fluted point on the surface of a pre-Holocene ridge at AMA-369 (Delacorte et al. 2000). Although, additional late Pleistocene cultural materials were lacking at the site, ten Bodie Hills hydration readings ranged between 6.2 and 7.6 microns, with a mean of 6.8 microns, consistent with other early to middle Holocene hydration samples from the western slope (e.g., La Jeunesse and Pryor 1996a; Martin 1998; Milliken et al. 1997).

At the Skyrocket site (CAL-629/630), located in Salt Springs Valley, a Clovis point fragment was found in a buried soil identified as the black-clay stratum. This paleosol also contained a large accumulation of milling tools and numerous early Holocene wide-stem points. The black-clay stratum was capped by colluvial fan deposits during the middle Holocene (La Jeunesse and Pryor 1996c). Seven radiocarbon dates bracket the black-clay between 10,100 and 7500 cal BP. Eighty-nine Bodie Hills samples produced a mean of 7.3 microns with a very low coefficient of variation equaling 14%. Correspondingly old readings were also obtained from 35 Casa Diablo samples which generated an average value of 7.6 microns.

At Clarks Flat (CAL-342), early Holocene cultural debris was found in a buried early Holocene floodplain formed in an ancient meander loop of the Stanislaus River. This paleosol, referred to by West and Haynes (1990) as Unit C, contained a small collection of flaked stone tools, including eight wide-stem points. Six radiocarbon dates bracket the associated buried soil between 10,900 and 8125 cal BP. A much more substantial assemblage of wide-stem points and meta-sedimentary greenstone bifaces from Spit B at CAL-342, often-cited as early Holocene, actually derive primarily from middle Holocene colluvial deposits that cap the Unit C floodplain (contra Peak and Crew 1990).

Alluvial deposition during the middle to late Holocene is also responsible for the buried early to middle Holocene cultural stratum reported by Milliken et al. (1997) at CAL-1180/H. Located on an elevated Pleistocene-age terrace along the Calaveras River, this site was underlain by a partially truncated buried soil formed in alluvium (Stratum III) deposited on scoured, shale bedrock. A radiocarbon date of 10,715 cal BP provides a minimum age for this stratum. Although the site stratigraphy is heavily compromised by widespread natural and anthropogenic mixing, the buried soil of Stratum III contained a characteristically early assemblage of meta-sedimentary greenstone artifacts, including a wide-stem point, and thick hydration readings. Of the total Bodie Hills hydration sample (n=51), over half (53%) of the readings ranged between 6.0 and 11.8 microns

microns, with a mean of 7.7 microns. A similar pattern occurs in the small sample of Napa Valley obsidian, where five of nine hydration rims (56%) fall between 6.1 and 9.2 microns (mean=7.4 microns).

At an elevation equivalent to the Tahoe Basin (6,500 feet [1,980 meters] amsl), one of the earliest radiocarbon-dated cultural deposits in California was discovered in Alpine County. At site ALP-192 in Gabbott Meadow, Peak and Neuenschwander (1991:120), reported a "compacted floor surface, hearth, and rock feature" interpreted as the partial remains of a house structure. These features are associated with an early Holocene buried soil, capped by approximately two meters (6.6 feet) of younger colluvial fan deposits that form the sloping piedmont surrounding the meadow (Stine 1991). Three radiocarbon dates from the feature complex range between 11,120 and 10,455 cal BP. No other temporally diagnostic artifacts or obsidian hydration samples derive from this stratum.

At two other sites on the piedmont surrounding Gabbott Meadow, characteristically old projectile point forms and equivalent hydration readings suggest regular use during the early Holocene. For example, at ALP-109, two basally thinned, concave-base points and a basally thinned wide-stem point were associated with colluvial sediments deposited on a bedrock step approximately two meters (6.6 feet) above the meadow. Bodie Hills hydration readings on these specimens are 6.3, 6.9and 7.3 microns microns, respectively. Numerous late prehistoric Desert Series arrow points from ALP-109 indicate the site was re-used during the late Holocene. A similar situation occurs at nearby site ALP-149, where at least five complete and fragmentary wide-stem points, similar to those of the early Holocene Western Stemmed tradition, were found in a basal stratum of brown, gravelly loam (>90 centimeters [3.0 feet] below surface). Three hydration readings from these specimens range between 5.3 and 5.7 microns (Peak and Neuenschwander 1991). Like ALP-109, diagnostic late Holocene projectile points are also present at the site, evincing long term use of this locality.

The Geomorphic Context of Middle Holocene Cultural Deposits (7000-4000 cal BP)

Throughout much of central California, the middle Holocene began with a relatively brief interval of landscape instability and deposition (see Chapter 4; Meyer 1996; Meyer and Rosenthal 1997; Rosenthal and Meyer 2004a, 2004b). As early as 7000 cal BP, hill slopes were eroded and channels, floodplains and fans began to aggrade, effectively capping portions of many latest Pleistocene to early Holocene land surfaces and associated archaeological deposits. This interval of deposition is indicated by the common occurrence of buried soils dating older than 7000 cal BP in the narrow valleys of the Coast Range, in the Sacramento and San Joaquin valleys, and in many fans and meadows of the Sierra Nevada (Rosenthal and Meyer 2004a, 2004b; Meyer et al. 1999; Meyer in Rosenthal 2006). Following the depositional interval, these landforms stabilized and soils once again developed. This was the first of many widespread cycles of deposition and landform stability that occurred in central California during the middle and late Holocene. As a result, middle Holocene age buried soils are widespread throughout central California, as are associated archaeological deposits.

Central Valley

With the exception of scattered surface artifacts and rare hydration readings cited above, archaeological deposits more than approximately 4000 cal BP are almost completely lacking in the Sacramento Valley. Recently, however, White (2003a) identified a deeply buried and stratified site (COL-247) near the Sacramento River in Colusa County along rural Highway 45. The deepest (Unit I) of two buried soils at COL-247 was found to contain archaeological debris and produced a radiocarbon date of 5970 cal BP. The lower portion (C Horizon) of the overlying buried soil (Unit II) also contained archaeological deposits dating to the end of the middle Holocene. A date of 4385 cal BP provides a maximum age for the buried cultural deposit in Unit II and suggests that a period of alluvial deposition occurred at the site after 5900 cal BP, but before 4380 cal BP. A period of deposition in the Sacramento Valley at about this same time appears to be recorded at two other sites. Middle Holocene components at the Llano Seco site (BUT-233) and the Wurlitzer site (BUT-294) are buried below more than 150 centimeters of late Holocene alluvium and are assumed to be associated with buried soils. These components returned radiocarbon dates of 4780 and 4465 cal BP, respectively. Unfortunately, however, the stratigraphic context and age of these sites has not been fully reported.

In addition to these buried components, only one other site within the Sacramento Valley proper has produced a high frequency of obsidian hydration readings evincing middle Holocene occupation (Table 26). Site SAC-133 is located on a pre-Holocene fan deposit adjacent to the Cosumnes River, and is dominated by material

from the late Holocene (Bouey and Waechter 1992). However, about 10% of the total hydration readings range between 6.9 and 5.5 microns, including 11% of the total Napa Valley readings and 33% of the total Bodie Hills readings (Table 26). This hydration range roughly translates to 7300 to 4500 cal BP Napa Valley (Origer 1982) and 7550 to 4200 cal BP Bodie Hills (Rosenthal and Meyer 2004c).

Table 26. Sites with a High Proportion of Middle Holocene Hydration Readings, District 3.

Site	Bodie Hills 6.9-5.5µ 7550-4200 cal BP		Napa Valley 6.9-5.5µ 7500-4500 cal BP		Borax Lake 6.9-6.0µ 6200-4200 cal BP		Site Total Middle Holocene	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Sacramento Valley								
COL-247	-	-	-	-	2	0.20	58	0.07
SAC-133	2	0.33	8	0.11	-	-	90	0.11
Coast Range								
COL-076	-	-	-	-	7	0.15	47	0.32
COL-081	-	-	1	0.25	3	0.08	47	0.13
COL-160	-	-	1	0.10	12	0.18	94	0.14
COL-165	-	-	10	0.21	4	0.40	58	0.26
GLE-217	-	-	-	0.00	37	0.21	205	0.18
Sierra Nevada								
BUT-0362/H	1	0.20	3	0.17	3	0.14	71	0.14
ELD-145	44	0.10	4	0.31	-	-	470	0.10
PLA-594/H		0.00	2	0.17	-	-	17	0.12
PLA-605/H	1	1.00	1	0.20	-	-	9	0.33
PLA-606/H	6	0.35	41	0.29	2	0.14	175	0.29
PLA-627/H	2	0.25	4	0.36	-	-	21	0.33
PLA-689	3	0.23	-	-	-	-	16	0.19
PLA-695/H	10	0.12	6	0.12	-	-	132	0.12
PLA-728/H	4	0.14	3	0.20	-	-	57	0.12

Other Central Valley Sites

Southeast of the Delta, just outside District 3, only the oldest of the distinctive Windmiller Culture sites dates to the middle Holocene. Located near the town of Thornton in a broad bend of the Mokelumne River, cultural deposits at the Blossom Mound (SJO-68) have been radiocarbon dated between 5000 and 3100 cal BP. This site is located in a broad floodplain mapped as late Holocene (Rosenthal and Meyer 2004b). Although it is not clear whether the cultural deposit was buried, SJO-68 is in a unique geomorphic position, situated on a low remnant Pleistocene or early Holocene levee, overtaken on all sides by late Holocene alluvial deposits (Heizer 1949:12; Lillard et al. 1939:31-32; Ragir 1972:27, 39). Of the 70 Napa Valley hydration readings obtained from this site, almost one-quarter (24%) range between 5.5 and 6.9 microns, while 12% (n=2) of the 17 Bodie Hills readings fall within this middle Holocene range (Bouey 1995).

Coast Ranges

Given broad exposures of pre-Holocene and early Holocene landforms, it is probably significant that five (56%) of the nine sites with hydration samples from the eastern side of the Coast Ranges include high proportions of middle Holocene-age hydration readings. Both COL-76 and -81 include comparatively large numbers of Borax Lake readings between 6.9 and 6.0 microns (Table 26), translating to roughly 6200 to 4200 cal BP (White et al. 2002). As noted in the previous section on the early Holocene, these are near-surface deposits located on pre-Holocene stream terraces. Sites COL-160 and -165 are also situated in a similar geomorphic setting, on pre-Holocene stream-side terraces (Moratto et al. 1995; Origer and Waechter 1990). Between 14 and 26% of the total

hydration readings from these sites date to the middle Holocene (see Table 26). At COL-165, 40% of the Borax Lake readings fall between 6.9 and 6.0 microns, while 21% of the Napa Valley readings fall in the middle Holocene range (i.e., 6.9 to 5.5 microns); middle Holocene frequencies of both sources are approximately one-half at COL-160 (see Table 26). Site GLE-217 is situated on an early Holocene terrace along Stony Creek, just west of the Sacramento Valley proper (White and Weigel 2006). Although the site deposit, like those described above, is dominated by late Holocene obsidian, just over 20% of the total Borax Lake sample falls in the middle Holocene.

Other Coast Range Sites

Although evidence for middle Holocene occupation in the Coast Ranges of District 3 comes exclusively from surface deposits associated with older landforms, sites of this age to the south in the eastern Diablo Range are buried beneath late Holocene alluvium. Charcoal samples retrieved from human graves identified in a buried soil at CCO-637 returned three radiocarbon dates between 5700 and 4700 cal BP. A fourth date of about 2500 cal BP from this same stratum indicates the cultural deposit was not buried at this location until the latest Holocene. In the adjacent drainage to the south, a middle Holocene cultural deposit (CCO-18/548) was also discovered in association with a buried soil along Marsh Creek (Rosenthal et al. 2006). Five radiocarbon dates from the buried cultural deposit at CCO-18/548 range between 7060 and 5400 cal BP. A small sample of Napa Valley obsidian hydration readings from the buried soil averages 6.6 microns (range=5.9-8.8 microns) or roughly 5500 cal BP. Several radiocarbon dates from an Early Period midden at the surface of this site indicate that the middle Holocene component was buried by at least 3,700 years ago. This suggests a period of deposition at CCO-18/548 after 5400 cal BP but before 3700 cal BP.

A very similar period of deposition is also recorded in the interior of the Diablo Range at CCO-309. The deepest cultural deposit at this latter site was associated with a buried soil and produced five radiocarbon dates between 5050 and 4420 cal BP (Price et al. 2006). Five radiocarbon dates from strata immediately overlying the buried soil at CCO-309 range between 3680 and 3350 cal BP, suggesting deposition at this site occurred after 4420 cal BP, but before 3680 cal BP. Two other middle Holocene deposits have also been identified in the interior of the eastern Diablo Range in association with buried soils: CCO-308C near San Ramon (Fredrickson 1966) and at ALA-483 in the Livermore Valley (Bard et al. 1989). Both of these sites, however, appear to have been buried as late as 2800 cal BP (Rosenthal and Meyer 2004a).

Sierra Nevada

As opposed to the scant evidence for middle Holocene human occupation in the Central Valley, archaeological deposits of this age are comparatively common in the foothills of the Sierra Nevada. The context of many of these finds supports the widespread evidence for a brief interval of fan and floodplain deposition at the beginning and end of the middle Holocene. These processes are reflected at several archaeological sites in the lower foothills south of the study area where middle Holocene archaeological materials are incorporated into buried soils formed on coarse-grained middle Holocene colluvial and alluvial deposits. Within District 3, evidence for middle Holocene use of the Sierra Nevada comes mainly from hydration readings obtained from surface sites (see Table 26).

The same grouping of sites near Lincoln, in Placer County, that produced high proportions of early Holocene hydration readings also evince regular middle Holocene occupation. Between 36 and 17% of the Napa Valley readings from PLA-594, -605, -606, and -627, are 6.9 to 5.5 microns, while between 100 and 25% of the Bodie Hills readings fall within this same time bracket. All four of these sites are associated with pre-Holocene landforms. However, cultural material was recovered from colluvial deposits reaching as much as 2.0 meters below surface at PLA-606/H (Jackson 1996), suggesting some deposition on this landform during the middle or late Holocene.

Farther up the Sierra, three sites on pre-Holocene landforms in the yellow pine forest have produced hydration evidence of middle Holocene occupation. At Dad Young Spring (PLA-689) located on Nevada Point Ridge, almost one-quarter (24%) of the Bodie Hills readings and 20% of the total hydration readings fall between 6.9 and 5.5 microns. North of the Middle Fork of the American River, on the Foresthill divide, sites PLA-695 and -728 both include relatively high proportions of middle Holocene hydration readings (see Table 26). Although these sites are mapped on pre-Holocene landforms, buried soils containing archaeological material were

identified at both sites (Baker 2000a, 2000b), suggesting these landforms have been active during the Holocene. In Locus 4 of PLA-695, a radiocarbon date of 4030 cal BP was obtained from the C-horizon immediately above an artifact-bearing, buried soil. This date indicates the underlying stratum is at least middle Holocene in age and is consistent with evidence just described for a period of deposition in the Sacramento Valley and Coast Ranges at the beginning of the late Holocene, about 4,000 years ago (see also Rosenthal and Meyer 2004a, 2004b).

Unfortunately, few other sites in the upper Sierra Nevada provide substantial evidence for middle Holocene occupation. While low frequencies (<3%) of middle Holocene hydration readings (i.e., between 6.9 and 5.5 microns) are observed at several sites in the Tahoe Basin, the true age of these hydration samples is difficult to assess due to poor resolution of hydration rates in cooler upland settings. Although, non-cultural, middle Holocene-age radiocarbon dates were obtained from two sites in the Martis Valley (PLA-5 and -6), only 3% or less of the 228 hydration readings from these sites fall in the 6.9 to 5.5 microns range. Significantly, however, a culturally sterile buried soil identified at PLA-6, returned a radiocarbon date of 4730 cal BP. A second date of 3045 cal BP was obtained from the overlying buried soil, marking a period of deposition after 4700 cal BP, but before 3050 cal BP. As noted at PLA-695, this interval correlates with the timing of several other depositional records at lower elevations in central California.

Other Sierra Nevada Sites

South of District 3, in the watersheds of the Tuolumne and Stanislaus Rivers, several well-dated middle Holocene deposits have been found in the blue oak-grey pine belt of the lower foothills. At CAL-342 on Clarks Flat, a robust assemblage of flaked and ground stone tools is contained within a colluvial fan deposit referred to by West and Haynes (1990) as stratigraphic Unit D (Peak and Crew's Spit B). Radiocarbon dates indicate this stratum was laid down during a relatively short interval between 7460 and 7180 cal BP, but was available for human occupation well into the late Holocene. As a result of long-term exposure, archaeological accumulations associated with most of the middle and late Holocene are associated with this fan deposit (Peak and Crew 1990). Bodie Hills hydration readings from Stratum D range between 2.7 and 8.3 microns with a mean of 5.3 microns (n=243).

At the Redbud Site (CAL-347), also located on Clarks Flat, archaeological materials were found in the buried alluvial Stratum D (O'Brien 1984). A radiocarbon date of 7535 cal BP was obtained from this buried soil developed in a coarse deposit of early Holocene sands and gravels (Haltenhoff 1984; Stratum IIc). Associated archaeological materials are inferred to be at least middle Holocene in age based on a date of 3430 cal BP obtained from the overlying colluvial deposit. Similarly, a buried soil at the Texas Charley Gulch site (CAL-286) contains cultural debris thought to be at least middle Holocene in age. Located on a tributary of the Stanislaus River, a yellowish-brown, gravelly-clay paleosol, Stratum D (Haltenhoff's [1984] Unit II), produced radiocarbon dates of 6130 and 5900 cal BP. The overlying soil is dated to no later than about 1050 cal BP, suggesting that Stratum D at CAL-286 may have been available for human occupation through most of the middle and late Holocene.

Probably the most substantial assemblage of middle Holocene-age archaeological materials from the lower foothills was discovered at the Skyrocket site (CAL-629/630; La Jeunesse and Pryor 1996a, 1996b, 1996c). Several human graves and a diverse assemblage of flaked and ground stone tools were contained in a paleosol formed on a stratum of yellow-gravelly clay. Radiocarbon dates bracket this stratum between 7765 and 2720 cal BP. Bodie Hills hydration readings from the paleosol range between 8.7 and 1.1 microns with a mean of 4.7 microns (n=191). Middle Holocene components are also associated with a buried soil in the South-Central Locus of CAL-629/630; dates from this area of the site range between 7490 and 1760 cal BP. Unfortunately, a final accounting of the chronostratigraphy and related cultural assemblages from this complex site remains unavailable.

Just a few miles from the Skyrocket site, recent excavations sponsored by Caltrans along State Route 4 discovered middle Holocene archaeological deposits in a shallow buried soil at the Black Creek site (CAL-789; Rosenthal and McGuire 2004). Seven radiocarbon dates from this deposit provide evidence for middle Holocene occupation, ranging between 5390 and 4830 cal BP. Four other radiocarbon dates and obsidian hydration results suggest that use of CAL-789 continued into the late Holocene and was buried sometime between 2700 and 1200 cal BP. A sample of 72 Bodie Hills hydration readings from the site range between 6.4 and 1.2 microns, with a mean of only 4.2 microns.

The relatively recent burial of older landforms is recorded at several other sites with middle Holocene occupations in the upper foothills. For example, at Sonora, the Hess House site (TUO-4513) is associated with a residual soil buried about 200 to 300 years ago on a low spur-ridge. The oldest occupation is represented by two radiocarbon dates of 5590 and 6010 cal BP. Three other radiocarbon dates ranging between 2600 and 1400 cal BP indicate use of the site over several thousand years. Bodie Hills hydration results are also commensurate with occupation well into the late Holocene; 127 readings produced a mean of 4.4 microns and a range of 7.0 to 1.5 microns.

On a nearby spur-ridge in Sonora, the Edgemont Knoll (TUO-4559) produced a similar mélange of middle Holocene and later archaeological deposits associated with a buried, residual soil. This site however, contained a complex array of pit features and possible house depressions, radiocarbon dated between 6510 and 4415 cal BP. Obsidian hydration results and two other radiocarbon dates (1695 and 1165 cal BP) from the buried soil evidence occupation well into the late Holocene. Bodie Hills hydration readings from the Edgemont Knoll site range between 9.2 and 1.3 microns with a mean of 4.6 microns (n=55). Dates from the capping stratum indicate that the archaeological deposit and associated soil was not buried until about 660 cal BP.

The Geomorphic Context of Late Holocene Cultural Deposits (4,000 cal BP-Historic Period)

The late Holocene in central California was a time of considerable geomorphic change. The Sacramento-San Joaquin Delta expanded and stabilized during this time interval, fans and floodplains experienced multiple cycles of deposition and stability in concert with channels that avulsed sediment, built levees, and later incised. The archaeological record from this time period is extensive, with sites found throughout most environmental zones and in many geological settings; this is primarily a surface record. In localized areas throughout central California, many late Holocene archaeological sites are also buried, particularly those dating older than two thousand years (Meyer et al. 1999; Rosenthal and Meyer 2004a, 2004b).

Central Valley

In the Sacramento Valley, Holocene-age floodplains are set into the upper segments of older fans, creating low terraces along most major drainages entering the valley from the east and west. Toward the axis of the valley, these younger alluvial sediments spill over older floodplain surfaces and fill erosional cuts and basins formed during the early and middle Holocene. Archaeological sites associated with these younger floodplains rarely exceed 3,000 years old (for radiocarbon and obsidian hydration evidence, see *The Antiquity and Context…* on page 133). Earlier deposits are buried or found only where late Holocene sediments form a thin veneer on, or incompletely cap, older surfaces (e.g., the Windmiller sites). While hundreds of late Holocene surface sites have been recorded in the Sacramento Valley, just 13 buried deposits from this interval have been identified (Table 27). Seven of these buried sites have produced radiocarbon dates or obsidian hydration readings, while seven contain diagnostic artifacts allowing for age estimates.

Undated buried components have been reported from at least three sites along the Sacramento River. At SAC-29, Olsen (1963:17) identifies a "buried occupation deposit" between 320 and 350 centimeters below the surface, separated from the overlying Late and Middle period midden by culturally sterile, sandy alluvium. Based on a radiocarbon date from the overlying mound, the buried component at SAC-29 is at least 1,700 years old. Located at the confluence of the Sacramento and American Rivers, SAC-26 is buried by historic-period mining debris. A radiocarbon date of 2840 cal BP was obtained from a buried soil beneath the cultural deposit as part of the current study. Artifacts reported from the site suggest the midden deposit dates to the Late Period (i.e., <700 years old). The Strawberry site (SAC-28) was recorded in the 1940s by Fritz and Harry Riddell and includes a Late Period surface midden and an older, buried component exposed near the Sacramento River at a depth of 365 centimeters. Artifacts reported by the Riddells suggest the buried deposit dates to the Middle Period (2500 to 900 cal BP) or earlier. Curtis (1961) reported a buried deposit at a depth of 2.75 meters eroding into the stream channel at SAC-201 along Arcade Creek in the city of Sacramento. Although, no chronological information exists from this site, contracting-stem dart points reported by Curtis (1961:23), suggest that this deposit may date to the Early Period of the late Holocene.

While not clearly reported by the original researchers (e.g., Bouey 1995; Peak and Associates 1984; Milliken et al. 1995), both SAC-42 and -43 along the Sacramento River appear to include buried components. For example,

at SAC-43 the two deepest radiocarbon-dated burials (found between 100 and 150 centimeters below surface), also produced the two oldest dates (2430 and 2185 cal BP). Twenty other dates from the site range between 1685 and 535 cal BP, suggesting an older surface may be present beneath the mound. At SAC-42, Milliken (1995) reports a date of 2442 cal BP from a hearth located at the upper contact between a weakly developed buried soil (2Ab Horizon in Stratum C2) and the overlying midden (Clay in Milliken et al. 1995:6.5). Both of these sites provide some evidence for a period of deposition along the Sacramento River after about 2100 cal BP.

Table 27. Buried Late Holocene Archaeological Sites in the Sacramento Valley and Coast Ranges

Site	Radiocarbon Age		Deposit	Depth (cm)		Surface Soil (as mapped)	Reference
	Minimum	Maximum		Minimum	Maximum		
COL, Lower Freshwater	-	-	Buried soil	60	120	Westfan	This study
COL, Upper Freshwater	3880	-	Buried Soil	195	195	Westfan	This study
COL-158	970	1180	Buried Soil	110	120	Vina	White (2003a)
COL-245/H	740	910	Buried Soil	110	120	Vina	White (2003a)
COL-247	1550	4398	Buried Soil	80	90	Moonbend	White (2003a)
SAC-026, Joe #3	-	-	Buried Soil	120	140	Columbia	Lillard et al. (1939)
SAC-028, Strawberry Site	-	-	Buried Soil	365	455	Lang	Riddell and Riddell (1940)
SAC-029	-	-	Buried Soil	320	350	Sailboat	Olsen (1963)
SAC-042	2442	-	Buried Soil	120	120	Valpac	Milliken et al. (1995)
SAC-043	2040	2545	Buried Soil?	150	150	Valpac	Bouey (1995)
SAC-126, Booth Site	-	-	Buried Soil	0	152	Vina	Lillard and Purves (1936)
SAC-168B	3250	-	Buried Soil	84	168	Cosumnes	Ragir (1972)
SAC-201, Arcade Creek	-	-	Buried Channel	270	280	Live Oak	Curtis (1961)
SAC, Dry Creek	3480	-	Buried Soil	150	170	Sailboat	Rosenthal and Meyer (2004b)
YOL, Chickahominy Site	680	-	Buried Soil	110	120	Brentwood	This study
YOL, Lambs Valley	-	-	Buried Soil	610	630	Zamora	This study
YOL-017, Upper Capay	-	-	Buried Soil	15	35	Arbuckle	Johnson (1968)
YOL-175	-	-	Buried Soil	160	200	Yolo	Moratto et al. (1995)

Two sites along the Cosumnes River are believed to contain buried components, including SAC-168 and -126. The latter deposit, known as the Booth site, dates to the Late Period and was first reported by Lillard and Purves (1936). Johnson (1976:21) suggests SAC-126 and other unrecorded deposits along the Cosumnes were buried by historic-period mining outwash, a conclusion supported by the current mapping effort. The nearby Erich Mound (SAC-168) was described by Ragir (1972) in her dissertation on the Early Horizon. Site SAC-168 appears to be located on an elevated remnant of a pre-Holocene alluvial fan along the Cosumnes River. The mound and shallow Late Period midden were capped by approximately 20 centimeters of recent alluvium—probably mining debris. However, a buried Early Period midden (ca. 168 centimeters) was identified beneath a "light-tan hardpan" (Ragir 1972:17-18). This lower component was described as a compact, brown midden and produced a radiocarbon date of 3250 cal BP. Clamshell disk beads and other ornaments indicate the upper midden dates to the Late Period, Phase 2 (<400 years old).

On Dry Creek, a tributary stream of the Mokelumne River dividing Sacramento from San Joaquin counties, a buried archaeological site was recently discovered by Rosenthal and Meyer (2004b). This site was associated with a buried soil dated to 3480 cal BP. Although the actual age of the archaeological deposit remains unknown, it was buried sometime during the late Holocene. On the western side of the lower Sacramento Valley, excavation for the PGT pipeline uncovered a buried late Holocene site at YOL-175. Located at the mouth of Perkins Canyon near the town of Winters, a small sample (n=6) of unsourced obsidian produced hydration readings between 2.5 and 1.6 microns (mean=2.0 microns). The hydration evidence suggests YOL-175 was buried less than 1,000 years ago.

Farther north along the Sacramento River, buried components were identified by White (2003a) at three sites in Colusa County, including COL-247, previously discussed (see the Middle Holocene section on page 149). The second of three buried soils at this site contained archaeological deposits from the Early and Middle

Periods of the late Holocene, returning radiocarbon dates between 3460 and 1550 cal BP. This stratum (Unit II) capped a middle Holocene buried soil (Unit I), and was itself covered by another depositional package (Unit III) sometime after 1500 cal BP. In Locus D of nearby site COL-158, a buried soil containing archaeological material was identified at a depth of just over one meter (White 2003a). Radiocarbon samples from the buried soil returned dates of 1180 and 970 cal BP. Likewise, buried cultural deposits from a buried soil at COL-245 returned dates of 910 and 740 cal BP, suggesting both of these sites were buried sometime after 740 cal BP (White 2003a).

Other Central Valley Sites

Only one buried archaeological site component has been identified from the northern San Joaquin Valley. This component is associated with a buried soil at SJO-264 (Delacorte 2001) and is radiocarbon dated to 2660 cal BP

Coast Ranges

At least five buried late Holocene sites are known from the small valley systems on the east side of the Coast Ranges in District 3, four of which were identified as part of the current study. These narrow valleys commonly include distinct terrace sequences dating from the latest Pleistocene through the Holocene. In these drainage systems, axial floodplains almost always include stratified deposits of Holocene alluvium distinguished by multiple buried soils.

At the northern end of Capay Valley, Johnson (1968) identified a partially buried Late Period midden at YOL-17. Examination of this site as part of the current investigation revealed a dense accumulation of fire-affected rock, other habitation debris, and a charcoal-filled, sub-midden pit exposed in the east bank of Cache Creek. The deposit was buried beneath a recent alluvial fan originating from a nearby side-drainage. As part of the current effort, two buried sites were also observed in floodplain deposits along Freshwater Creek in Colusa County. The base of the exposed midden (195 centimeters) at the upper Freshwater Creek site returned a radiocarbon date on charcoal of 3880 cal BP. A buried soil beneath the midden dates to the middle Holocene or earlier. Cultural materials were also observed along the lower reaches of Freshwater Creek, but this deposit remains undated. In Yolo County, a cut-bank in the floodplain of Lambs Valley exposed several deeply buried (>6.0 meters) artifacts associated with a buried soil. Along Chickahominy Slough, a rock-lined hearth and associated midden were observed in a buried soil situated on an inset terrace. A date of 680 cal BP from the hearth feature indicates the terrace was capped within the last few hundred years.

Other Coast Range Sites

Buried late Holocene sites have been discovered in virtually all of the major valley systems in the northern Diablo Range and in scattered locations throughout the southern north Coast Ranges (Meyer and Rosenthal 1997, 2007; Rosenthal and Meyer 2004a, 2004b). Although too numerous to describe in detail, buried late Holocene sites are particularly common on the east side of the Coast Ranges, and have been identified in various locations throughout the Napa Valley (Martin and Meyer 2005; Meyer and Rosenthal 2007), Livermore Valley (Rosenthal and Byrd 2005; Meyer and Rosenthal 2007), Walnut Creek-San Ramon Valley (Meyer and Rosenthal 2007; Rosenthal and Meyer 2004a), Santa Clara Valley, and on the margins of the San Joaquin Valley west of the Delta (Meyer and Rosenthal 2004a). In all cases, where detailed stratigraphic descriptions exist, these buried deposits are associated with buried soils.

Sierra Nevada

Although most Sierra Nevada landforms are identified as Pre-Holocene, the presence of buried soils and buried archaeological deposits indicates that hill slopes, colluvial and alluvial fans, and floodplains were all active during the middle to late Holocene. As a result, buried sites in the Sierra Nevada are often found in unexpected places such as relatively minor low-angle ridges, mid-slope benches, and in footslope positions. These sites also commonly include two or more separate stratigraphic units within one-meter of the modern surface.

Buried soils and associated cultural deposits at the middle and late Holocene sites of PLA-695, -728, and ELD-145, previously discussed, reflect localized processes of late Holocene landscape evolution on bedrock

landforms (see the Middle Holocene section on page 149). Four other Sierra sites on low-angle ridges in District 3 also appear to contain buried soils with associated archaeological deposits. Site NEV-194 at Rex Reservoir was reported by Pastron et al. in 1984. Two artifact-bearing strata were present at the site located on a bedrock ridge. The surface stratum consisted of a thin deposit of light brown silty loam containing late Prehistoric arrow points and other artifacts. Below an abrupt contact, the deepest stratum was characterized as red-brown clay, interpreted here as a buried residual soil formed on decomposing bedrock. Two radiocarbon dates of 4160 and 3460 cal BP from this clay stratum indicate that the associated cultural deposit likely dates to the beginning of the late Holocene or end of the middle Holocene. At nearby sites NEV-203 and -251, White and Origer (1987) report stratigraphic sequences similar to that identified at NEV-194. Both sites included buried soils formed on decomposing bedrock capped by late Holocene slope-wash sediments. White and Origer (1987:145-146) note:

> At both CA-NEV-203 and CA-NEV-251 occupation deposits of the initial phase are capped by a layer that could represent a possible occupation hiatus. The similar stratigraphic placement of the layers in the sites suggests they are contemporaneous phenomena, and their similar appearance and content at two sites several miles apart indicate that it was a fairly widespread event with similar consequences to the cultural and depositional status of the site locales.

Although no radiocarbon dates were obtained from these sites, arrow points recovered from the surface stratum at NEV-251, and numerous obsidian hydration readings, indicate the lower cultural components were likely buried during the late Holocene. A third site in Nevada County (NEV-120) also appears to include a buried artifact-bearing soil, capped by recent slope-wash sediments. A radiocarbon sample from the probable buried soil returned a date of 2950 cal BP (Peak and Associates 1988).

Other Sierra Nevada Sites

Like the Coast Ranges, the list of late Holocene buried sites and site components from the western slope of the Sierra, is quite large. A recent synthesis of archaeological sites in the watersheds of the Tuolumne, Stanislaus, Calaveras, and Mokelumne rivers found that of the 68 chronologically discrete components from 43 separate sites, 44% occur in buried stratigraphic contexts (Meyer 2006). More importantly, greater than one-half of the site components between 3,000 and 1,100 years old were found in buried contexts, while more than 90% of older site components (middle and early Holocene) were buried. In contrast, all of the sites less than 1,100 years old were identified at the surface (Meyer 2006). Meyer's (2006) analysis also revealed that between 40 and 50% of site components associated with bedrock ridges, footslopes, and alluvial fans/floodplains were buried. From this, it seems clear that even a large proportion of the late Holocene archaeological record in the western Sierra is obscured by recent landscape changes, particularly in geomorphic positions typically viewed as non-depositional (e.g., bedrock ridges).

Summary

Development of the central California landscape during the middle and late Holocene has clearly had an effect on our understanding of the region's archaeological record, particularly from the latest Pleistocene and first half of the Holocene. In the Central Valley, extensive Holocene-age fans and floodplains have capped portions of many older landforms, leaving only discontinuous surface remnants near the active waterways. It is in these locations, where older landforms converge with stream and river channels, that the earliest evidence of human occupation is found at the surface. Buried archaeological deposits from the latest Pleistocene and early Holocene have not yet been reported from the Sacramento Valley. Likewise, mapping of Quaternary alluvial landforms in the valley shows that geological deposits dating to latest Pleistocene and early Holocene are quite rare in the modern surface landscape. However, the presence of buried latest Pleistocene and early Holocene soils beneath late Holocene surface landforms suggests that archaeological deposits from these time periods are likely associated with buried surfaces. Of the few known middle Holocene archaeological deposits from the valley, each has been identified in a buried stratum beneath a late Holocene surface landform.

Evidence for burial of the early Holocene record in the Sierra Nevada and Coast Ranges is more direct, as the best dated sites from this period are found beneath middle and late Holocene colluvial fans and alluvial floodplains. Obsidian hydration evidence for early Holocene occupation is also found on the surface of many pre-Holocene landforms east and west of the valley. In the Sierra, early through middle Holocene sites commonly

occur in buried soils capped by colluvial fans and footslope deposits. Erosion too may have taken a toll on the Sierra record, as older archaeological materials appear to have occasionally been transported and incorporated into younger geological strata.

Because of the cyclical nature of late Holocene deposition on the valley floor, even a significant part of the late Holocene archaeological record appears to be buried, particularly that portion more than 3,000 years old. The same is true in the Sierra Nevada and Coast Ranges, where fans and floodplains developed cyclically through the late Holocene. Even in landscape positions like low-angle hills and ridges, typically assumed to be non-depositional, periodic slope-wash during the late Holocene has often resulted in stratified site deposits with buried components.

CHAPTER 6: BURIED SITE POTENTIAL AND ARCHAEOLOGICAL SITE STRUCTURE

Based on recent geoarchaeological studies conducted throughout central California, there is an increasing understanding of Holocene landscape evolution and the way in which broad geomorphic changes have affected the region's archaeological record (e.g., Rosenthal and Meyer 2004a, 2004b). A review of paleoenvironmental information from central California (see Chapter 2) indicates that significant climatic fluctuations over the last 20,000 years are manifest in a number of proxy records. Although previous geological studies have focused on the presumed relationship between glacial intervals and fan and floodplain development on the eastern side of the Central Valley (e.g., Atwater 1980; Dupre et al. 1991; Marchand and Allwardt 1981), roughly synchronous episodes of deposition and stability are recorded within unglaciated watersheds in both the Coast Range and lower Sierra Nevada (Helley 1966; Lettis 1985). Similar widespread cycles of deposition and landscape stability are also recognized during the Holocene, when glacial advances would have had little influence on these processes (Clark and Gillespie 1997). These patterns seem to indicate that large-scale climatic changes and not glacial cycles, per se, were influencing development in the regional landscape (Lettis 1985; Meyer 1996; Meyer and Rosenthal 1997; Rosenthal and Meyer 2004a, 2004b).

Review of the geological literature and the results of our field studies indicate that the geomorphic landscape in District 3 has changed significantly during the span of human occupation. In the Sacramento Valley and lower Coast Range and Sierra-Cascade foothills, major landscape changes during the Holocene have included: (1) partial erosion and truncation of latest Pleistocene and older surfaces; (2) subsequent burial of latest Pleistocene and early Holocene surfaces on fans and floodplains during the early and middle Holocene; (3) partial erosion and removal of early Holocene floodplains; (4) subsequent deposition and periodic stability of floodplains during the middle and late Holocene; and (5) deposition of alluvium on portions of most lowland floodplains during the latest Holocene.

In the upper Coast Range and Sierra-Cascade foothills and higher elevations on the western slope, major Holocene landscape changes have included: (1) partial erosion and truncation of Pleistocene surfaces on hillslopes; (2) subsequent burial of latest Pleistocene and early Holocene surfaces in fans, floodplains, and footslopes during the early and middle Holocene; (3) erosion of many latest Pleistocene and early Holocene floodplains in the lower foothills during the middle Holocene; (4) subsequent deposition and relative stability of floodplains during the middle and late Holocene; and (5) deposition of alluvium on most floodplains and colluvium on some hillslopes and footslopes during the latest Holocene (Meyer and Dalldorf 2004).

These landscape changes have clearly affected the ability of archaeologists to identify and sample deposits from the early and middle Holocene. Two-thirds of the radiocarbon-dated sites from the Sacramento Valley are associated with late Holocene surface landforms. As a result, the current record of human occupation is overwhelmed by sites dating no more than a few thousand years old. While sites from earlier time periods are recognized on the surface of older landforms in central California, they are also commonly found associated with buried middle and early Holocene-age soils. Late Holocene sites, too, regularly occur in buried contexts, revealing that even the most recent record of human occupation has been partially obscured by changes to the geomorphic landscape. These patterns suggest that a significant portion of the archaeological record in District 3 is buried, and will not be identified through pedestrian archaeological survey. Consequently, a primary goal of this study was to identify those landforms likely to contain buried archaeological deposits and those that are either too old (>13,500 cal BP) or too young (<150 cal BP) to contain these resources. Thus, our mapping effort focused on those portions of the surface landscape that are Holocene in age.

In acknowledging the results of previous research in central California, we recognize that buried archaeological deposits are not distributed randomly throughout the landscape, but occur in specific geo-environmental settings (Rosenthal and Meyer 2004a). For example, fans and floodplains consistently contain buried archaeological deposits, indicating some relationship between these landforms and past settlement activities. Ideally, predictions about where buried archaeological sites are located would take into account a number of characteristics related to the past distribution of important subsistence resources (i.e., distance to water) and other environmental factors (e.g., aspect, ecotone, slope) that may have made a specific location more favorable for occupation than another. Thus, some local environmental variables may be more predictive of site locations that the default use of the information offered by this study. In this regard, the value of personal insight,

intuition, and understanding of a place or project area should not be underestimated for predicting the locations of archaeological sites, whether they are buried or not.

Detailed predictive modeling, however, is best accomplished in smaller geographic regions (e.g., Allen et al. 1999; Rosenthal and Meyer 2004a), where aspects of the biotic and geomorphic environment can be more easily accounted. With the current study, we sought to develop a general planning tool that would allow for relatively quick assessment of buried site potential at the scale of the landform. While this approach should be relatively accurate in identifying the types of landforms most likely to yield buried archaeological resources, it is not designed to pin-point where, within those landforms, buried sites will be found. That type of assessment is best undertaken on a project-by-project basis. As a consequence, the buried site potential depicted in Map 1 (in back pocket) and associated probability statements should only serve as an initial guide for planners. However, by simply using the age of landforms, we were able to determine that there is a low to very low potential for buried archaeological deposits in almost three-quarters (73.6%) of the area mapped within the Sacramento Valley and Coast and Sierra-Cascade Ranges.

BURIED SITE POTENTIAL IN THE SACRAMENTO VALLEY AND SIERRA NEVADA AND COAST RANGE FOOTHILLS

The potential for buried archaeological deposits within the Sacramento Valley and portions of the adjacent foothills was determined based on the mapped distribution of different Quaternary-age landforms, as depicted in Map 1. Five categories of buried site potential were identified: Very Low, Low, Moderate, High, and Very High (Table 28). It is easy to justify a very low potential for buried sites in landforms dating from the latest Pleistocene and earlier; these contexts are too old to harbor subsurface archaeological deposits. The potential for discovery of buried sites within Holocene-age landforms was determined based on the age of a particular landform and the probability that any one spot on that landform was occupied at some time in the past.

Table 28. Buried Site Potential of Different Landforms in the Sacramento Valley and Adjacent Foothills.

POTENTIAL CATEGORY	LANDFORM
Low to High	Historical to Modern Fans, Floodplains, Artificial Fill, and Cuts; Water
Very Low	Pre Pleistocene through Latest Pleistocene Hillslopes, Fans, and Floodplains
Low	Early Holocene Fans and Floodplains
Moderate	Middle Holocene Fans and Floodplains
High	Late Holocene Fans and Floodplains
Very High	Latest Holocene Fans and Floodplains

For example, an early Holocene surface landform can only contain buried sites dating to the earliest Holocene or latest Pleistocene (i.e., the Paleo-Indian and Paleo-Archaic periods). We therefore consider early Holocene surface landforms to have a Low potential for buried sites, not because we believe such sites are absent, but simply because we believe the actual probability of finding a buried site in a landform of this age is low. There was a very short 2,000- or 3,000-year window that humans could have occupied any one spot on the landscape during the latest Pleistocene, and human population densities are thought to have been comparatively low, resulting in fewer site locations.

The same logic applies to the sensitivity of all subsequent Holocene-age landforms. The younger the age of the landform, the higher the likelihood that buried archaeological deposits will be discovered (Map 1). This results from two main factors: (1) Holocene-age surface landforms in the study area commonly contain multiple Holocene-age buried soils (i.e., former land surfaces); and (2) within young surface landforms, the aggregate of time represented by Holocene-age buried soils is greater than the aggregate of time represented by buried soils in older surface landforms. Thus, due to the greater length of time, there is a higher probability that an underlying landform was occupied. Also, we assume that archaeological deposits from later time periods are more common overall due to higher population densities. Soils buried later in time, therefore, have a higher probability of containing archaeological materials.

The relationship between time and archaeological potential also allows us to predict which landforms are likely to yield buried archaeological deposits from specific cultural periods and which are not (Table 29). For example, land surfaces that range from latest Pleistocene to early Holocene in age will not contain buried sites dating to the Lower Archaic through Emergent periods (Table 29). Conversely, late Holocene-age surface landforms may contain buried archaeological deposits associated with most major cultural periods in central California (Table 29).

In total, 32,758 square kilometers (12,648 square miles) within the Sacramento Valley and adjacent uplands were evaluated for buried site potential (Table 30; Map 1 [in back pocket]). Of this total, 24,115 square kilometers (9310.8 square miles; ~73.6%) were determined to have a Very Low or Low potential for buried sites. Only 8,644 square kilometers (3.337.5 square miles; ~26.4%) of this region was considered to have Moderate to Very High potential for buried archaeological sites (Table 30).

Table 29. Preservation Potential for Archaeological Deposits in the Sacramento Valley and Adjacent Foothills.

Cultural Period (cal BP)	Latest Pleistocene ~15,000-11,500	Early Holocene ~11,500-7,000	Middle Holocene ~7,000-4,000	Late Holocene ~4,000-2,000	Latest Holocene ~2,000-150	Historical ~150-present
Paleo-Indian (13,500-11,500)	High Potential for Buried Sites	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites
Paleo-Archaic (11,500-7000)	No Potential for Buried Sites	High Potential for Buried Sites	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites
Lower Archaic (7000-5000)	No Potential for Buried Sites	No Potential for Buried Sites	High Potential for Buried Sites	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites
Middle Archaic (4000-2500)	No Potential for Buried Sites	No Potential for Buried Sites	High Potential for Buried Sites	High Potential for Buried Sites	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites
Upper Archaic (2500-900)	No Potential for Buried Sites	No Potential for Buried Sites	No Potential for Buried Sites	Moderate Potential for Buried Sites	High Potential for Buried Sites	Moderate Potential for Buried Sites
Emergent (900-150)	No Potential for Buried Sites	No Potential for Buried Sites	No Potential for Buried Sites	No Potential for Buried Sites	High Potential for Buried Sites	Moderate Potential for Buried Sites
Historical (150-50)	No Potential for Buried Sites	No Potential for Buried Sites	No Potential for Buried Sites	No Potential for Buried Sites	Low Potential for Buried Sites	High Potential for Buried Sites

Notes: High, Moderate, Low, and None represent the estimated potential for a stratum to contain archaeological deposits of a cultural period.

Table 30. Buried Site Potential by Landform in the Sacramento Valley and Adjacent Uplands.

Buried Site Potential	Map Unit	Square kilometers	% of Area Mapped
Very Low	Pre-Pleistocene	18,116.0	55.30
Very Low	Older Pleistocene	3,615.0	11.04
Very Low	Latest Pleistocene	2,382.0	7.27
Low	Early Holocene	354.2	1.08
Moderate	Middle Holocene	347.1	1.06
High	Late Holocene	3,675.5	11.22
Very High	Latest Holocene	1,929.5	5.89
High	Historical-Modern	1,011.1	3.09
Variable	Historical-Modern Cut/Fill	467.7	1.43
Variable	Water (H2O)	858.1	2.62
n/a	Unmapped (City of Orland)	2.5	0.01

Evaluation of buried site potential along Caltrans highways within District 3 identifies 27.2% of the total distance (including a 10-meter buffer right-of-way buffer) as having High or Very High potential for buried archaeological resources (Table 31). Of this, Interstate 5 and State Route 45 cover the greatest number of linear acres identified as High or Very High Potential, with 550 and 457 acres, respectively (Table 31). Eight other highways cover between 210 and 150 acres identified as High or Very High potential for buried archaeological resources, while the other 28 roadways in District 3 cover less than about 100 acres with elevated potential (Table 31).

Depending on the nature of a proposed project and scope of work, landforms mapped as Moderate through Very High potential should receive additional consideration during the planning process, perhaps leading to focused geoarchaeological studies which might include additional geological research, field inspections, backhoe trenching, coring, or other methods. In evaluating the need for additional fieldwork within areas mapped as Moderate through Very High potential, variables such as distance to modern watercourses, or micro-topographic variation (e.g., the presence of levees or buried stream channels) should also be considered, as well as the geomorphic context of previously identified, buried archaeological deposits described in Chapter 5. Certain geo-environmental variables will be more predictive of the specific location of buried deposits than the default use of map units offered by this study. For example, in the southern Santa Clara Valley it was found that archaeological site density is highest within 300 meters of a watercourse (Rosenthal and Meyer 2004a:76).

SIERRA NEVADA AND CASCADE RANGES

Areas mapped as Very Low and Low potential likely require no additional consideration for buried resources. The exception to this, however, occurs in uplands of the Sierra-Cascade ranges. In these regions, we believe that the Soils Database and our current mapping likely under represent the distribution of landforms that have been active during the Holocene. We know from studies throughout the Sierra that very specific segments of the landscape were emplaced over the last 15,000 years. These localized landforms have been subsumed into the large areas mapped as Pre-Pleistocene (i.e., Low Potential; Map 1 [in back pocket]). Our analysis of the geomorphic context of archaeological sites in the Sierra-Cascade Range reveals that many buried sites are contained within these discrete landforms (see Chapter 5). Therefore, in the Sierra-Cascade Range, the types of geomorphic contexts identified in the discussion below should also be evaluated on a project-by-project basis for their potential to harbor buried archaeological sites.

Although we were able to map the Sierra Nevada in some detail, we believe that large areas mapped as pre-Holocene actually mask many small localized landforms that were active during the Holocene and contain buried archaeological deposits. Consequently, this section identifies the specific types of landforms in the Sierra that are Holocene in age and are known to contain buried archaeological deposits. These include meadows, fans, footslopes, floodplains, inset terraces, and some hillslope positions (Table 32).

Archaeological materials dating to any time from the latest Pleistocene to latest Holocene (i.e., Paleo-Indian through Emergent periods) may be associated with buried soils found in meadows, fans, and footslopes (Table 32 and Table 33). Previous studies (e.g., Meyer and Dalldorf 2004) have shown that narrow floodplains and inset terraces generally contain buried land surfaces that range from middle to late Holocene in age, and are therefore likely to contain only archaeological deposits from the Middle Archaic through Emergent periods (Table 33). The age and depth trend of radiocarbon dates from buried deposits in the Sonora area indicates that archaeological materials may be buried in fans and footslopes at depths ranging from about 0.6 meters (2 feet) to more than 2.5 meters (8.2 feet) below surface, and buried archaeological deposits may occur at depths of 4.5 meters (14.7 feet) or more in some meadows and floodplains (Meyer and Rosenthal 2004b). Buried sites have also been discovered at depths approaching 1 meter (3.3 feet) in some hillslope positions, including mid-slope benches and low-angle (nearly level) ridges (Meyer and Dalldorf 2004). These examples suggest a wide range of variability in the location and depth of buried archaeological deposits depending on local conditions.

The heterogeneity of the landscape within the Sierra Nevada, combined with the relatively active history of depositional landforms, mandate that buried site potential be considered more fully on a project-by-project basis. The types of landforms listed in Table 32, should serve as a general guide, leading to more focused geoarchaeological studies in these contexts. Other variables such as proximity to surface water should also be

Table 31. Total Area Covered by each Map Unit along each District 3 Roadway.

Roadway	Water Variable	Historic-Modern Variable	Total Variable Potential	Pre-Pleistocene Very Low	Older Pleistocene Very Low	Latest Pleistocene Very Low	Early Holocene Low	Total Low and Very Low Potential	Middle Holocene Moderate	Total Moderate Potential	Late Holocene High	Latest Holocene Very High	Total High and Very High Potential	Grand Total	Percent of Roads
Brockway	-	-	-	5.5	6.0	1.2	-	12.7	-	-	0.8	-	0.8	13.5	0.1%
Colfax	-	2.0	2	47.6	-	-	-	47.6	-	-	-	-	-	49.7	0.4%
I-5	5.4	32.3	37.7	-	146.0	141.5	66.1	353.6	32.8	32.8	412.6	135.1	547.7	971.8	8.7%
I-505	-	2.7	2.7	39.5	6.5	1.6	28.2	75.8	21.5	21.5	78.5	-	78.5	178.4	1.6%
I-80	2.7	214.7	217.4	298.1	45.6	224.5	2.6	570.8	0.7	0.7	38.2	56.4	94.6	883.5	7.9%
I-80 (Business Rte)	0.8	0.7	1.5	-	-	2.2	-	2.2	-	-	-	9.7	9.7	13.3	0.1%
North Shore	-	-	-	-	0.3	-	-	0.3	-	-	-	-	-	0.3	0.0%
Shoo Fly	-	-	-	3.3	-	-	-	3.3	-	-	-	-	-	3.3	0.0%
State Hwy 12	4.4	34.1	38.5	-	-	-	-	-	-	-	-	12.4	12.4	50.9	0.5%
State Hwy 16	4.6	33.4	38	135.7	135.5	24.2	77.2	372.6	23.5	23.5	129.1	29.5	158.6	592.8	5.3%
State Hwy 20	1.8	45.2	47	374.7	105.6	109.3	-	589.6	13.1	13.1	160.2	50.4	210.6	860.4	7.7%
State Hwy 28	7.6	-	7.6	7.1	-	0.4	-	7.5	-	-	-	-	-	15.1	0.1%
State Hwy 32	1.4	11.1	12.5	227.2	6.0	3.5	-	236.6	-	-	73.8	30.0	103.8	353.0	3.2%
State Hwy 45	18.2	50.0	68.2	-	23.0	1.5	21.0	45.6	4.8	4.8	180.5	276.2	456.7	575.3	5.2%
State Hwy 49	10.7	69.1	79.8	807.1	60.1	83.1	-	950.3	-	-	44.3	20.9	65.2	1095.3	9.8%
State Hwy 65	0.1	10.9	11	17.0	134.3	8.2	-	159.5	-	-	36.9	-	36.9	207.4	1.9%
State Hwy 70	9.9	31.9	41.8	202.7	254.3	22.8	-	479.8	11.1	11.1	103.1	57.4	160.5	693.3	6.2%
State Hwy 84	5.7	1.8	7.5	-	-	0.0	-	0.0	0.1	0.1	13.8	136.4	150.2	157.9	1.4%
State Hwy 88	-	-	-	88.9	-	-	-	88.9	-	-	0.7	-	0.7	89.6	0.8%
State Hwy 89	17.6	16.7	34.3	262.5	40.8	266.1	4.4	573.9	-	-	55.9	18.1	74	682.1	6.1%
State Hwy 99	4.6	91.4	96	44.8	134.4	148.8	-	328.0	-	-	185.7	9.0	194.7	618.7	5.5%
State Hwy 104	0.8	-	0.8	44.5	86.3	1.6	-	132.5	10.3	10.3	-	-	-	143.7	1.3%
State Hwy 113	2.0	22.5	24.5	-	1.8	45.5	4.4	51.8	7.1	7.1	92.4	114.3	206.7	290.1	2.6%
State Hwy 128	1.5	0.4	1.9	23.5	16.0	14.3	40.4	94.3	-	-	49.5	5.8	55.3	151.4	1.4%
State Hwy 149	-	49.0	49	12.3	17.1	1.7	-	31.1	-	-	1.1	-	1.1	81.2	0.7%
State Hwy 160	125.5	40.3	165.8	-	-	-	-	-	-	-	-	201.2	201.2	367.0	3.3%
State Hwy 162	12.9	34.3	47.2	441.8	51.0	75.1	10.2	578.1	53.6	53.6	159.7	14.3	174	853.0	7.6%
State Hwy 174	-	5.1	5.1	21.8	-	-	-	21.8	-	-	-	-	-	26.9	0.2%
State Hwy 191	-	5.4	5.4	60.7	6.8	6.3	-	73.9	-	-	-	-	-	79.2	0.7%
State Hwy 193	1.8	49.0	50.8	256.2	-	1.6	-	257.8	-	-	-	-	-	308.7	2.8%
State Hwy 220	0.4	-	0.4	-	-	-	-	-	-	-	-	21.2	21.2	21.6	0.2%
State Hwy 267	-	3.7	3.7	51.7	17.2	3.5	-	72.3	-	-	2.4	-	2.4	78.4	0.7%
State Hwy 275	0.4	0.1	0.5	-	-	-	-	-	-	-	-	-	-	0.5	0.0%
Undefined	-	0.5	0.5	6.1	-	1.9	-	8.0	-	-	1.9	-	1.9	10.3	0.1%
US Hwy 50	0.4	57.3	57.7	416.1	9.2	102.9	-	528.2	-	-	6.3	2.8	9.1	595.1	5.3%
US Hwy 50 (new)	-	-	-	-	-	0.9	-	0.9	-	-	-	-	-	0.9	0.0%
US Hwy 50 (old)	-	-	-	-	-	1.1	-	1.1	-	-	-	-	-	1.1	0.0%
US Hwy 395	-	-	-	0.6	10.3	13.1	-	24.1	0.8	0.8	-	-	-	24.9	0.2%
Victory	5.8	11.6	17.4	-	-	-	-	-	-	-	-	3.3	3.3	20.7	0.2%
Washington	0.3	0.6	0.9	0.3	-	-	-	0.3	-	-	-	-	-	1.1	0.0%
Grand Total	247.3	928.1	1175.4	3897.3	1314.0	1308.9	254.5	6774.8	179.3	179.3	1827.3	1204.6	3031.9	11161.4	100.0%
Percent of Roads	2.2%	8.3%	10.50%	34.9%	11.8%	11.7%	2.3%	60.7%	1.6%	1.6%	16.4%	10.8%	27.20%	100.0%	-

Notes: Includes a 10-meter buffer along each roadway.

considered in identifying areas for additional study. However, because buried archaeological sites have been discovered in a number of landform contexts in the Sierra, including some hillslope positions, it is difficult at this point to predict precisely where such deposits will be found, beyond the general types of landforms noted.

Table 32. Buried Site Potential in Sierra Nevada Landforms.

Landform Type	Age Range (cal BP)	Description	Typical Age of Buried Soils
Meadows	15,000-150	Usually found in basins with level or nearly level surfaces at elevations of more than 6,000 feet amsl.	Early, Middle, and Late Holocene
Fans and Footslopes	15,000-400	Typically have gently sloping surfaces (~8 degrees or less) that occur at the base of slopes and in concave landscape positions.	Early, Middle, and Late Holocene
Floodplains and Inset Terraces	4500-50	Usually form level or nearly level surfaces that are adjacent to modern stream or river channels	Middle and Late Holocene
Hillslope Positions	Pre-Holocene to 400	Includes broad gently sloping benches at mid-slope positions or nearly level ridges and nose slopes	Middle and Late Holocene

Table 33. Estimated Preservation Potential for Archaeological Deposits in the Sierra Nevada.

Cultural Period (cal BP)	Meadows	Fans and Footslopes	Hillslope Benches and Ridges (some)	Alluvial Floodplains and Inset Terraces
Paleo-Indian (13,500-11,500)	High Potential for Buried Sites	High Potential for Buried Sites	Low Potential for Buried Sites	No Potential for Buried Sites
Paleo-Archaic (11,500-7000)	High Potential for Buried Sites	High Potential for Buried Sites	Low Potential for Buried Sites	No Potential for Buried Sites
Lower Archaic (7000-5000)	High Potential for Buried Sites	High Potential for Buried Sites	High Potential for Buried Sites	Moderate Potential for Buried Sites
Middle Archaic (4000-2500)	High Potential for Buried Sites	High Potential for Buried Sites	High Potential for Buried Sites	High Potential for Buried Sites
Upper Archaic (2500-900)	High Potential for Buried Sites	High Potential for Buried Sites	High Potential for Buried Sites	High Potential for Buried Sites
Emergent (900-150)	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites	Moderate Potential for Buried Sites	High Potential for Buried Sites
Historical (150-0)	Low Potential for Buried Sites	Low Potential for Buried Sites	Low Potential for Buried Sites	Moderate Potential for Buried Sites

Note: High, Moderate, Low, and None represent the estimated potential of a landform to contain archaeological deposits of a particular cultural period.

APPROACHES FOR IDENTIFYING AND SAMPLING BURIED SITES

To identify where buried sites may be located, it is first necessary to understand the age, nature, and extent of Holocene-age depositional landforms. The current overview and mapping effort represents an initial attempt to identify these contexts at a general level in the eleven-county region of District 3. Map 1 (back pocket) shows the age of depositional landforms and should serve as a starting point for resource managers concerned with the potential for buried archaeological deposits within a particular project area. Depositional landforms identified as Late and Latest Holocene in age have a high likelihood of containing buried archaeological sites; therefore, proposed projects within these landforms should be evaluated for their potential to impact buried resources. Landforms identified as pre-Pleistocene in the uplands of the Sierra-Cascade range also have the potential to contain buried archaeological deposits; however, data regarding the age of these landforms is so imprecise, it is necessary to consult additional sources of information and conduct field inspections to determine if sensitive Holocene-age contexts are present within these map units.

Based on the timing and nature of landscape evolution and evidence from previously excavated archaeological sites, a number of general observations can be made about the structure of the archaeological record

in District 3. These observations should assist in designing and implementing future field strategies and in interpreting the chronostratigraphic context of excavated sites.

The way in which radiocarbon dates, obsidian hydration readings, and other chronometric information is obtained and interpreted suggests that many archaeologists are searching for a simple time-depth relationship to the archaeological record. This assumption probably stems from the prevailing view of stratigraphy as discrete, well-defined layers built up over time, like those found in rock shelters and shell mounds. However, anthropogenic and natural sediment input was seldom sufficient to build chronostratigraphic structure in the archaeological record of central California. In fact, the dominant geomorphic process during the Holocene was landform stability, with little or no sediment input for hundreds or thousands of years at a time. When deposition did occur, it often resulted in large amounts of sediment accumulating on fans and floodplains in very short periods of time. Similar patterns of landform development are wide-spread in central California (Meyer et al. 1999; Rosenthal and Meyer 2004a, 2004b) and have a number of implications for understanding the structure of the archaeological record.

1. Cultural stratigraphy often occurs at the scale of entire landforms. Brief intervals of deposition followed by extended periods of landform stability have resulted in multiple late Pleistocene and Holocene buried soils (i.e., buried land surfaces) in fans and floodplains throughout central California. Archaeological excavations and surveys that do not account for the entire Holocene depositional record will likely miss buried and potentially significant archaeological deposits.
2. Buried archaeological deposits are most often associated with buried soils. Because humans tend to occupy landforms during periods of stability, most archaeological deposits will be associated with the surface or near-surface horizons of surface and buried soils. As such, the identification of buried archaeological sites will be facilitated by the identification of buried soil horizons which are often laterally extensive and traceable over considerable distances.
3. Because sediment deposition was typically rapid, a significant amount of sterile sediment may separate a surface archaeological deposit and a buried one. Depositional episodes would likely have discouraged human occupation on actively aggrading landforms, at least temporarily. As a consequence, older portions of the archaeological record may be missed if hand excavation is halted after the surface archaeological deposit is exhausted, without accounting for the potential of more deeply buried materials. This is especially true for the alluvial fans and floodplains in lowland valleys, where Holocene-age buried soils are often found as deep as three to four meters (10 to 13 feet) below surface.
4. While buried sites are often temporally discrete they can also be chronologically mixed. Archaeological materials deposited over periods of long-term land stability may be discarded (super-imposed) on a common surface, whether or not that surface was subsequently buried. In addition, since human occupation was seldom continuous on aggrading landforms, archaeological materials found deeper in a soil profile are often the result of downward mixing from natural and cultural processes (biogenic and anthropogenic respectively). Thus, deeper archaeological materials found in stable landforms may be no older than shallower materials.

These observations about the structure of the archaeological record should, in part, dictate the types of sampling strategies and methods employed during the identification phase and subsequent testing and data recovery investigations for archaeological studies. As an initial step, research on the age of project area landforms should be completed prior to any field investigations. This will allow for a focused study of landforms with a potential for buried deposits, and minimize effort in landforms lacking buried site potential. In addition, field methods should be designed to account for both the horizontal and vertical extent of Holocene-age geological deposits at an individual archaeological site or within a particular study area. These deposits will be bounded by stratigraphic unconformities, typically distinguished by buried soil profiles. The timing of soil development and alluvial and colluvial deposition has important implications for bracketing the age of buried archaeological sites, as well as defining the timing and nature of Holocene landscape evolution. Consequently, future studies should seek to identify and obtain radiocarbon dates for buried land surfaces and capping deposits to better refine the natural chronostratigraphic sequence of depositional landforms within District 3.

Understanding the age of surface landforms is not only relevant for determining buried site potential, but is also important for identifying under-represented portions of the archaeological record, particularly site deposits more than 3,000 years old. As demonstrated above, 30% of the surface sites studied from older geological contexts in the Sacramento Valley produced archaeological material from the middle and early Holocene. It should be expected, therefore, that sites found in association with these older surfaces will contain earlier and/or under-represented portions of the archaeological record. As two-thirds or more of the known archaeological record in District 3 dates to less than 3,000 years old, older and under-represented sites will have elevated significance from the standpoint of archaeological research and legal compliance. Thus, an informed and integrated geoarchaeological approach would likely help future archaeological studies in the region address these research and methodological issues.

Sampling Methods

The ability to locate buried sites in the study area depends on whether or not appropriate methods are properly used to explore sensitive landforms. While testing for buried archaeological sites is becoming an important part of the initial identification process in California and across the country, testing approaches are varied, idiosyncratic, and often reflect the training or biases of particular archaeologists (Monaghan et al. 2006). In response, transportation agencies in states such as Michigan and Minnesota have funded research to evaluate and develop methodologies for identifying buried sites (Monaghan et al. 2006; Monaghan and Lovis 2005). Methods commonly used include: (1) backhoe trenching; (2) combined coring and auguring; and (3) geophysical survey (resistivity, magnetometry, and ground-penetrating radar).

The overall success, efficacy, and cost/benefit of these methods were evaluated as part of a large-scale study in Minnesota. This comparison found that backhoe trenching was the most effective way of identifying buried archaeological sites (Monaghan et al. 2006: ii). This finding is further supported by the extensive experience of the author in his work throughout California. Since most of the known buried archaeological deposits in the study region occur at depths of four meters (~13.1 feet) or less it appears that subsurface exploration using a backhoe will be the most appropriate method for identifying potentially buried sites in most of the sensitive portions of District 3.

Coring or auguring, however, may be the only method that can be used in some locations—such as urban or wetland settings, or areas where Holocene-age deposits exceed the depth (thickness) accessible with a backhoe or excavator (about 4.5-7.3 meters [15-24 feet] respectively). Consequently, the selection of an appropriate sampling method will likely depend on the nature and extent of earth disturbances (i.e., horizontal and vertical area of potential effects) proposed for a landform or group of landform-deposits in a specific project area. When designed and conducted in an informed fashion, subsurface explorations often help satisfy the Level of Effort requirement specified in Section 106 that "a reasonable and good faith effort to carry out appropriate identification efforts" is made to identify archaeological resources [800.4(b)(1)].

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APPENDIX A

RADIOCARBON DATABASE FOR CALTRANS DISTRICT 3

Appendix A: Radiocarbon Database

Map No.	County, Area or Site	Context	Deposit	Provenience	Material	Min. Depth cm	Max. Depth cm	14C B.P.	+/-	Min. Cal BP	Cal B.P.	Max. Cal BP	AD/-BC	Lab. No.	Reference	Soil Series Name
1	BUT, Gridley	Natural	Buried deposit	West of Feather River, Gianella silt loam, PM-II	Charcoal	160	160	3020	130	2854	3196	3478	-1246	GX-2191	Marchand and Alwardt 1981; Busacca 1982	GIANELLA
2	BUT, Honcut Creek	Natural	Buried soil	70 m east of west powerline, north bank of creek	Charcoal (burnt bark)	210	210	450	45	429	504	549	1446	Beta-001651	Busacca 1982	WILSONCREEK-TRAINER
3	BUT, Honcut Creek	Natural	Surface deposit	70 m east of west powerline, north bank of creek	Wood	40	40	595	70	516	598	669	1352	Beta-001653	Busacca 1982	WILSONCREEK-TRAINER
4	BUT, Honcut Creek	Natural	Buried alluvium	South bank of creek near south to SW turn	Charcoal	280	280	1045	95	759	964	1174	986	Beta-001654	Busacca 1982	TRAINER
5	BUT, Honcut Creek	Natural	Buried alluvium	400 m west of Hwy 70 in northeast creek bank	Charcoal (burned stump)	250	250	1625	90	1330	1522	1720	428	Beta-001649	Busacca 1982	TRAINER
6	BUT-084, Oroville Reservoir	Cultural	Surface deposit	Unit 01	Charcoal	90	90	240	150	-3	268	499	1682	UCR-0183	Breschini et al. 1996	WATER
7	BUT-084, Oroville Reservoir	Cultural	Surface deposit	Unit 01	Bone (human)	120	120	950	150	651	875	1180	1075	UCR-0184	Breschini et al. 1996	WATER
8	BUT-131, Flag Canyon	Cultural	Surface deposit	Ridge east of Western Pacific Railroad tracks	Unknown	?	?	370	150	243	385	568	1565	I-1221	Breschini et al. 1996	PALEXERULTS
9	BUT-131, Flag Canyon	Cultural	Surface deposit	Ridge east of Western Pacific Railroad tracks	Unknown	?	?	565	250	59	551	935	1399	I-1222	Breschini et al. 1996	PALEXERULTS
10	BUT-157, Oroville	Cultural	Surface deposit	North bank Feather River, Trench C, Unit L-24	Charcoal	76	91	1220	100	954	1140	1301	810	I-3165	Price 1982; Breschini et al. 1996	DUNSTONE-LOAFERCREEK
11	BUT-157, Oroville	Cultural	Surface deposit	North bank Feather River, Trench A	Charcoal	?	?	1855	100	1541	1786	2000	164	I-3169	Breschini et al. 1996	DUNSTONE-LOAFERCREEK
12	BUT-157, Oroville	Cultural	Surface deposit	North bank Feather River, Trench C?, Burial 2	Charcoal	152	185	2800	100	2747	2931	3169	-981	I-3170	Breschini et al. 1996	DUNSTONE-LOAFERCREEK
13	BUT-157, Oroville	Cultural	Surface deposit	North bank Feather River, Trench C, Unit L-24?	Charcoal	152	183	2820	100	2752	2954	3213	-1004	I-3170?	Breschini et al. 1996	DUNSTONE-LOAFERCREEK
14	BUT-182, Oroville	Cultural	Surface deposit	West bank of Feather River, Structure 2, floor	Charcoal (grapevine)	?	?	335	85	269	387	529	1563	I-3168	Price 1982; Breschini et al. 1996	DUNSTONE-LOAFERCREEK
15	BUT-233, Llano Seco	Cultural	Surface deposit	Sample #1	Charcoal	61	76	1060	90	774	981	1179	969	GAK-2481	GAK data sheet provided by White	PARROTT (Occasional)
16	BUT-233, Llano Seco	Cultural	Buried soil	Sample #2	Charcoal	152	168	1190	90	955	1116	1284	834	GAK-2482	GAK data sheet provided by White	PARROTT (Occasional)
17	BUT-233, Llano Seco	Cultural	Buried soil	Burial 09	Organics	368	368	1340	250	738	1252	1739	698	GAK-1960	GAK data sheet provided by White	PARROTT (Occasional)
18	BUT-233, Llano Seco	Cultural	Buried soil	Pit 30R8	Charcoal	243	259	2140	100	1922	2132	2342	-182	GAK-3618	GAK data sheet provided by White	PARROTT (Occasional)
19	BUT-233, Llano Seco	Cultural	Buried soil	Sample #4, lower level per Basgall (1987)	Charcoal	335	335	4240	140	4423	4780	5080	-2830	GAK-2484	GAK data sheet provided by White	PARROTT (Occasional)
20	BUT-294, Wurlitzer Site	Cultural	Surface deposit	Mound on older landform; Pit 15W1, sample #1	Charcoal	30	45	520	80	431	547	667	1403	GAK-4095	GAK data sheet provided by White	FARWELL
21	BUT-294, Wurlitzer Site	Cultural	Surface deposit	Mound on older landform; Pit 16E4 and 17E4, Burial 23	Bone (human)	158	158	1200	95	954	1124	1291	826	GAK-4098	GAK data sheet provided by White	FARWELL
22	BUT-294, Wurlitzer Site	Cultural	Buried deposit	Mound on older landform; Pit 16E3, Burial 3	Bone (human)	182	182	2510	95	2352	2572	2757	-622	GAK-4097	GAK data sheet provided by White	FARWELL
23	BUT-294, Wurlitzer Site	Cultural	Buried deposit	Mound on older landform; Pit 17E1 and 17E2, Feature 17	Charcoal	213	243	2630	90	2457	2742	2951	-792	GAK-4096	GAK data sheet provided by White	FARWELL
24	BUT-294, Wurlitzer Site	Cultural	Buried deposit	Mound on older landform; Pit 14E3, Burial 25	Bone (human)	198	198	3990	110	4216	4466	4743	-2516	GAK-4099	GAK data sheet provided by White	FARWELL
25	BUT-496	Cultural	Surface deposit	Burial 16	Shell (Olivella bead F/M)	?	?	950	40	274	369	469	1581	Beta-146852	White 2000	GIANELLA
26	BUT-496	Cultural	Surface deposit	Burial 30	Shell (Olivella bead F3a)	?	?	1400	40	636	722	853	1228	Beta-150249	Milliken 2001	GIANELLA
27	BUT-496	Cultural	Surface deposit	Burial 23	Shell (Olivella bead M1a)	8	22	1440	40	663	760	884	1190	Beta-150246	Milliken 2001	GIANELLA
28	BUT-496	Cultural	Surface deposit	Burial 12	Shell (Olivella bead D1)	?	?	1440	40	663	760	884	1190	Beta-150247	Milliken 2001	GIANELLA
29	BUT-496	Cultural	Surface deposit	Burial 04	Shell (Olivella bead M1a)	?	?	1570	40	753	886	1009	1064	Beta-150248	Milliken 2001	GIANELLA
30	BUT-496	Cultural	Surface deposit	Burial 33	Shell (Olivella bead F3a)	?	?	1580	40	770	898	1028	1052	Beta-146853	White 2000	GIANELLA
31	BUT-496	Cultural	Surface deposit	Burial 05	Shell (Olivella bead F3a)	?	?	1620	40	800	943	1061	1007	Beta-150245	Milliken 2001	GIANELLA
32	BUT-496	Cultural	Surface deposit	Burial 08	Charcoal	?	?	1270	130	929	1179	1407	771	?	Milliken	GIANELLA
33	BUT-496	Cultural	Surface deposit	Burial 33	Bone (human)	?	?	1690	55	1506	1600	1720	350	?	Milliken	GIANELLA
34	COL, Funks Creek	Natural	Surface deposit	Trench FT-4c, Fault GG-1, QT2, Unit 4, C horizon	Charcoal	300	200	240	40	143	285	331	1665	Beta-133742	Unruh et al. 2001	CAPAY
35	COL, Funks Creek	Natural	Buried alluvium	Trench FT-4c, Fault GG-1, QT2, Unit 3	Charcoal	420	420	800	40	672	717	783	1233	Beta-133743	Unruh et al. 2001	CAPAY
36	COL, Funks Creek	Natural	Surface deposit	Golden Gate Dam Site, Trench FT-3a, Unit 2, C horizon	Charcoal	150	160	2200	40	2123	2231	2331	-281	CAMS-58038	Unruh et al. 2001	MILLSHOLM-ROCK OUTCROP
37	COL, Funks Creek	Natural	Buried channel	Golden Gate Profile, Strat. II, 2Cu, base of channel deposit	Charcoal	780	800	4670	70	5284	5410	5587	-3460	Beta-193914	Meyer and White in progress	CAPAY
38	COL, Funks Creek	Natural	Buried soil	Trench FT-2a. Fault GG-3, QT1, Unit 2, south of ranch	Charcoal	280	280	9250	40	10275	10425	10523	-8475	Beta-133741	Unruh et al. 2001	CORVAL
39	COL, Funks Creek	Natural	Buried soil	Golden Gate Profile, Strat. I, 3ABtb	Soil (SOM)	820	840	18860	220	21936	22409	23158	-20459	Beta-193913	Meyer and White in progress	CAPAY
40	COL, Funks Creek	Natural	Buried soil	Golden Gate Profile, Strat. I, 3Btb, "blue clay"	Soil (SOM)	950	960	19560	450	22257	23315	24450	-21365	Beta-193912	Meyer and White in progress	CAPAY
44	COL-011, Cache Creek	Cultural	Surface deposit	Pit	Shell (Olivella E3a)	?	?	870	30	185	294	417	1656	C-82182	?	SKYHIGH-MILLSHOLM
45	COL-037	Cultural	Surface deposit	Trench A-4	Bone (human)	0	50	720	80	539	671	792	1279	?	West et al. 1975	ALTAMONT-SEHORN
46	COL-081	Cultural	Surface deposit	Unit 08	Unknown	80	120	3360	140	3326	3615	3976	-1665	?	White 2003	ETSEL-MAYMEN-MARPA
47	COL-158, Stegeman	Cultural	Surface deposit	Locus A, housefloor, midden	Charcoal	30	40	870	40	695	781	832	1169	Beta-150821	White 2003	VINA (occasional)
48	COL-158, Stegeman	Cultural	Buried soil	Locus D, Buried Midden, 2Ab	Charcoal	110	120	1080	80	891	1004	1178	946	Beta-150818	White 2003	VINA (occasional)
49	COL-158, Stegeman	Cultural	Buried soil	Locus B, Housefloor in buried midden, 2Ab	Charcoal	70	85	1150	40	970	1062	1172	888	Beta-150822	White 2003	VINA (occasional)
50	COL-158, Stegeman	Cultural	Buried soil	Locus D, Buried Midden, 2Ab	Charcoal	110	120	1260	60	1060	1193	1294	757	Beta-150817	White 2003	VINA (occasional)
51	COL-245/H, Colusa M7	Cultural	Buried soil	Buried Midden; Burned Surface, 2Ab	Charcoal	110	120	840	70	673	768	911	1182	Beta-150819	White 2003	VINA (occasional)
52	COL-245/H, Colusa M7	Cultural	Buried soil	Buried Midden; Pit Lining, 2Ab	Charcoal	120	150	940	60	734	849	955	1101	Beta-150820	White 2003	VINA (occasional)
53	COL-247, Reservation Rd.	Cultural	Buried soil	Stratum 1 (top), hearth feature, 2Ab	Charcoal	80	90	1660	40	1507	1564	1633	386	Beta-150827	White 2003	MOONBEND
54	COL-247, Reservation Rd.	Cultural	Buried soil	Stratum 2 (top), midden, 3Ab	Charcoal	120	130	2630	40	2714	2756	2813	-806	Beta-150828	White 2003	MOONBEND
55	COL-247, Reservation Rd.	Cultural	Buried soil	Stratum 1 (top), Burial 6, 3Ab	Shell (Olivella G2a)	120	130	2745	30	2768	2831	2889	-881	CAMS-80290	White 2003	MOONBEND
56	COL-247, Reservation Rd.	Cultural	Buried soil	Stratum 2 (bottom), midden, 3Ab	Charcoal	140	160	3010	40	3078	3216	3335	-1266	Beta-150826	White 2003	MOONBEND
57	COL-247, Reservation Rd.	Cultural	Buried soil	Stratum 3 (bottom), midden, 3Ab	Charcoal	215	245	3230	40	3377	3448	3557	-1498	Beta-150823	White 2003	MOONBEND
58	COL-247, Reservation Rd.	Cultural	Buried soil	Stratum 3 (bottom), midden, 3Ab	Charcoal	130	140	3350	40	3477	3588	3647	-1638	Beta-150824	White 2003	MOONBEND

Appendix A: Radiocarbon Database

Map No.	County, Area or Site	Context	Deposit	Provenience	Material	Min. Depth cm	Max. Depth cm	14C B.P.	+/-	Min. Cal BP	Cal B.P.	Max. Cal BP	AD/-BC	Lab. No.	Reference	Soil Series Name
59	COL-247, Reservation Rd.	Cultural	Buried soil	Stratum 2 (middle), midden, 3Ab	Shell (Olivella L2)	215	245	3585	35	3826	3889	3982	-1939	CAMS-82181	White 2003	MOONBEND
60	COL-247, Reservation Rd.	Cultural	Buried soil	Stratum 3, Burial 11 Pit, 3Ab	Charcoal	220	230	3950	60	4230	4398	4536	-2448	Beta-142092	White 2003	MOONBEND
61	COL-247, Reservation Rd.	Natural	Buried soil	Unit 01, matrix, 4Ab	Soil (SOM)	280	290	5230	60	5901	5999	6184	-4049	Beta-151594	White 2003	MOONBEND
62	ELD, Alder Creek	Natural	Buried soil	AC1-6PIC, 2Ab3	Wood (*Pinus* cone scale)	95	95	1020	50	891	937	1012	1013	Beta-103295	Bureau of Reclamation 2002	CHAIX
63	ELD, Alder Creek	Natural	Surface deposit	AC1-5AL, Cb2 horizon (1862?)	Charcoal (*Alnus*)	75	75	1740	50	1538	1652	1742	298	Beta-103294	Bureau of Reclamation 2002	CHAIX
64	ELD, Alder Creek	Natural	Buried soil	AC1-8AL, Bwb3	Charcoal (*Alnus*)	150	150	2850	40	2854	2965	3078	-1015	Beta-103296	Bureau of Reclamation 2002	CHAIX
65	ELD, Aloha Lake	Natural	Surface deposit	Core DW-5, above Mazama ash	Organic sediment (gyttja)	7	7	6740	60	7497	7603	7684	-5653	DW-C-2	Clark and Gillespie 1997	ROCK OUTCROP
66	ELD, Aloha Lake	Natural	Buried deposit	Core DW-5, below Mazama ash	Organic sediment (silt)	16	17	7140	70	7830	7965	8069	-6015	DW-C-1B	Clark and Gillespie 1997	ROCK OUTCROP
67	ELD, Baldwin Beach	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	4650	70	5275	5397	5585	-3447	Beta-33879	Lindstrom 1990	WATER
68	ELD, Baldwin Beach	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	5510	90	6174	6309	6493	-4359	Beta-33878	Lindstrom 1990	WATER
69	ELD, Cascade Lake	Natural	Submerged	Lakeshore	Wood	107	107	4790	400	4497	5464	6324	-3514	LJ-0503	Price 1982 (#226)	MEEKS
70	ELD, Echo Lake	Natural	Submerged	In lake?	Wood	610	910	330	70	281	390	513	1560	USGS-0024	Price 1982 (#581)	WATER
71	ELD, Echo Lake	Natural	Marsh	No depth?	Wood (bark)	?	?	910	85	682	829	961	1121	I-6843	Price 1982 (#582)	WATER
72	ELD, Emerald Bay	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	50	60	32	110	255	1840	Beta-32854	Lindstrom 2000	WATER
73	ELD, Emerald Bay	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	110	60	6	128	152	1822	Beta-32853	Lindstrom 2000	WATER
74	ELD, Emerald Bay	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	4720	70	5319	5457	5586	-3507	Beta-32852	Lindstrom 1990	WATER
75	ELD, Emerald Bay	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	4980	80	5595	5726	5900	-3776	Beta-32851	Lindstrom 1990	WATER
76	ELD, Fallen Leaf Lake	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	850	50	692	766	795	1184	Beta-133580	Lindstrom 2000	WATER
77	ELD, Lake Tahoe	Natural	Submerged	Submerged tree stump, cluster "C"	Wood (stump)	n/a	n/a	230	50	135	216	334	1734	Beta-90209	Lindstrom 2000	WATER
78	ELD, Lake Tahoe	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	4370	80	4828	4974	5092	-3024	Beta-32850	Lindstrom 1990	WATER
79	ELD, Lake Tahoe	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	4500	60	4960	5152	5317	-3202	Beta-32849	Lindstrom 1990	WATER
80	ELD, Lake Tahoe	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	4580	60	5045	5263	5334	-3313	Beta-32846	Lindstrom 1990	WATER
81	ELD, Lake Tahoe	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	4610	90	5039	5317	5488	-3367	Beta-32847	Lindstrom 1990	WATER
82	ELD, Lake Tahoe	Natural	Submerged	Submerged tree stump	Wood (stump)	n/a	n/a	4610	90	5039	5317	5488	-3367	Beta-32848	Lindstrom 1990	WATER
83	ELD, Meyers Grade Marsh	Natural	Buried marsh	Peat in lake	Peat	200	200	1550	105	1287	1455	1636	495	I-2341	Radiocarbon 1969 11:59; Price 1982 (#233/482)	TAHOE
84	ELD, Meyers Grade Marsh	Natural	Buried marsh	Peat in lake	Peat	300	300	2280	125	1998	2296	2618	-346	I-2342	Radiocarbon 1969 11:59; Price 1982 (#234)	TAHOE
85	ELD, Meyers Grade Marsh	Natural	Buried marsh	Peat in lake	Peat	400	400	2840	115	2751	2986	3265	-1036	I-2343	Radiocarbon 1969 11:59; Price 1982 (#235)	TAHOE
86	ELD, Meyers Grade Marsh	Natural	Buried marsh	Peat in lake	Peat	360	360	3225	190	2950	3453	3914	-1503	I-????	Price 1982 (#481)	TAHOE
87	ELD, Meyers Grade Marsh	Natural	Buried marsh	Halfway down Meyers Grade from Echo Summit	Wood	235	243	3350	95	3393	3594	3830	-1644	I-6517	LaJoie card file (USGS-HUD 11 P)	TAHOE
88	ELD, Old Rock Bridge	Natural	Unknown	BR3-2-2PI	Charcoal (*Pinus*)	?	?	180	50	60	173	233	1777	Beta-111947	Bureau of Reclamation 2002	AUBURN
89	ELD, Old Rock Bridge	Natural	Surface deposit	BR2-2-2PI, Bw	Charcoal (*Pinus*)	28	28	910	60	723	831	931	1119	Beta-111943	Bureau of Reclamation 2002	AUBURN
90	ELD, Old Rock Bridge	Natural	Surface deposit	BR1-2-2QU	Charcoal (*Quercus*)	73	73	1100	40	929	1008	1084	942	Beta-110733	Bureau of Reclamation 2002	AUBURN
91	ELD, Old Rock Bridge	Natural	Buried soil	BR1-3-2QU	Charcoal (*Quercus*)	63	63	1120	60	928	1035	1175	915	Beta-110736	Bureau of Reclamation 2002	AUBURN
92	ELD, Old Rock Bridge	Natural	Buried soil	BR1-2-3QU, 2Btjb horizon	Charcoal (*Quercus*)	102	102	1280	70	1055	1203	1311	747	Beta-110734	Bureau of Reclamation 2002	AUBURN
93	ELD, Old Rock Bridge	Natural	Surface deposit	BR1-2-1QU	Charcoal (*Quercus*)	40	40	1310	50	1167	1239	1309	711	Beta-110732	Bureau of Reclamation 2002	AUBURN
94	ELD, Old Rock Bridge	Natural	Surface deposit	BR1-3-3QU	Charcoal (*Quercus*)	90	90	1580	60	1345	1469	1605	481	Beta-110737	Bureau of Reclamation 2002	AUBURN
95	ELD, Old Rock Bridge	Natural	Surface deposit	BR3-1-1QU, Bw	Charcoal (*Quercus*)	56	56	1970	50	1818	1922	2051	28	Beta-111944	Bureau of Reclamation 2002	AUBURN
96	ELD, Old Rock Bridge	Natural	Buried soil	BR1-1-2QU	Charcoal (*Quercus*)	66	66	2430	50	2350	2488	2550	-538	Beta-110730	Bureau of Reclamation 2002	AUBURN
97	ELD, Old Rock Bridge	Natural	Buried soil	BR2-1-1MIX, Bw, (buried by 1862 A horizon)	Charcoal (mixed)	44	44	2860	50	2854	2985	3084	-1035	Beta-111939	Bureau of Reclamation 2002	AUBURN
98	ELD, Old Rock Bridge	Natural	Surface deposit	BR1-1-3QU	Charcoal (*Quercus*)	86	86	3120	50	3237	3345	3445	-1395	Beta-110731	Bureau of Reclamation 2002	AUBURN
99	ELD, Old Rock Bridge	Natural	Surface deposit	BR1-3-1QU	Charcoal (*Quercus*)	40	40	3440	70	3554	3705	3882	-1755	Beta-110735	Bureau of Reclamation 2002	AUBURN
100	ELD, Old Rock Bridge	Natural	Surface deposit	BR2-1-2QU, Cox	Charcoal (*Quercus*)	65	65	3510	70	3617	3786	3976	-1836	Beta-111940	Bureau of Reclamation 2002	AUBURN
101	ELD, Old Rock Bridge	Natural	Surface deposit	BR2-2-2QU, Bw	Charcoal (*Quercus*)	28	28	3750	60	3923	4113	4296	-2163	Beta-111942	Bureau of Reclamation 2002	AUBURN
102	ELD, Old Rock Bridge	Natural	Buried deposit	BR2-1-3PI, 2Cox	Charcoal (*Pinus*)	100	100	4620	90	5043	5336	5490	-3386	Beta-111941	Bureau of Reclamation 2002	AUBURN
103	ELD, Old Rock Bridge	Natural	Buried colluvium	BR3-1-4QU, base of terrace, 3Coxb2	Charcoal (*Quercus*)	168	168	6030	60	6720	6878	7022	-4928	Beta-111945	Bureau of Reclamation 2002	AUBURN
104	ELD, Osgood Swamp	Natural	Surface deposit	Stump rooted in marsh (upper pollen zone 1?)	Wood (tree stump)	10	30	910	85	682	829	961	1121	I-6843	Stine 1994	WATER
105	ELD, Osgood Swamp	Natural	Buried marsh	Base of pollen zone 1 in core	Charcoal	50	50	2920	200	2698	3086	3580	-1136	A-0544	Adam 1967	WATER
106	ELD, Osgood Swamp	Natural	Buried marsh	Gytta, swamp	Organic sediment	?	?	6890	160	7466	7743	8009	-5793	GAK-1704	Price 1982 (#578)	WATER
107	ELD, Osgood Swamp	Natural	Buried colluvium	Mudflow	Wood	?	?	7340	380	7458	8184	9021	-6234	A-0962	Price 1982 (#576)	WATER
108	ELD, Osgood Swamp	Natural	Buried deposit	Middle of pollen zone 3 in core	Charcoal	300	300	9990	800	9478	11524	13368	-9574	A-0545	Adam 1967	WATER
109	ELD, Ralston Ridge	Natural	Marsh	Bog on Ralston Ridge W of Echo Lake, Bore #1	Peat	38	40	1145	90	922	1072	1276	878	I-6841	Price 1982 (#583)	ROCK OUTCROP-ROCKBOUND
110	ELD, Ralston Ridge	Natural	Marsh	Questionable location	Organics	?	?	1155	85	931	1082	1264	868	I-7557	Price 1982 (#572)	ROCK OUTCROP-ROCKBOUND
111	ELD, Ralston Ridge	Natural	Marsh	Bog on Ralston Ridge W of Echo Lake, Bore #1	Peat	50	53	1345	95	1053	1255	1416	695	I-7072	LaJoie card file (USGS-HUD 34 PHP2)	ROCK OUTCROP-ROCKBOUND
112	ELD, Ralston Ridge	Natural	Marsh	Ralston Ridge #7 of Adam (LaJoie card file)	Organics	?	?	2595	85	2434	2670	2860	-720	I-7556	Price 1982 (#571)	ROCK OUTCROP-ROCKBOUND
113	ELD, Rubicon Point	Natural	Submerged	Submerged tree stump	Wood	n/a	n/a	1240	40	1167	1179	1261	771	Beta-133581	Lindstrom 2000	WATER

Appendix A: Radiocarbon Database

Map No.	County, Area or Site	Context	Deposit	Provenience	Material	Min. Depth cm	Max. Depth cm	14C B.P.	+/-	Min. Cal BP	Cal B.P.	Max. Cal BP	AD/-BC	Lab. No.	Reference	Soil Series Name
114	ELD, Sand Flat	Natural	Buried soil	SF1-1-2COB, Ab	Wood (conifer bark)	28	28	30	40	31	77	138	1873	Beta-108710	Bureau of Reclamation 2002	CHAIX
115	ELD, Sand Flat	Natural	Unknown	SF1-3-2ACS	Plant (Arctostaphylos)	?	?	50	40	24	96	141	1854	Beta-108716	Bureau of Reclamation 2002	CHAIX
116	ELD, Sand Flat	Natural	Surface deposit	SF2-1-3AL, Coxb	Charcoal (*Alnus*)	28	28	130	40	54	132	280	1818	Beta-108722	Bureau of Reclamation 2002	CHAIX
117	ELD, Sand Flat	Natural	Surface deposit	SF1-1-3AC, Cb	Charcoal (*Arctostaphylos*)	52	52	140	40		142	282	1808	Beta-108711	Bureau of Reclamation 2002	CHAIX
118	ELD, Sand Flat	Natural	Buried soil	SF2-1-4PIB, Bwb2	Wood (*Pinus* bark)	32	32	260	40	269	309	459	1641	Beta-108723	Bureau of Reclamation 2002	CHAIX
119	ELD, Sand Flat	Natural	Buried soil	SF2-1-8PIB, Bwb3	Charcoal (*Alnus*)	62	62	270	40	275	337	464	1613	Beta-108727	Bureau of Reclamation 2002	CHAIX
120	ELD, Sand Flat	Natural	Surface deposit	SF2-1-5PI, Coxb2	Charcoal (*Pinus*)	38	38	280	30	349	373	438	1577	Beta-108724	Bureau of Reclamation 2002	CHAIX
121	ELD, Sand Flat	Natural	Surface deposit	SF1-2-2PI, Bwb2	Charcoal (*Pinus*)	42	42	330	40	305	392	484	1558	Beta-108712	Bureau of Reclamation 2002	CHAIX
122	ELD, Sand Flat	Natural	Surface deposit	SF2-1-6AL, Coxb2	Charcoal (*Alnus*)	44	44	330	40	305	392	484	1558	Beta-108725	Bureau of Reclamation 2002	CHAIX
123	ELD, Sand Flat	Natural	Buried soil	SF1-4-1AL, Ab, (buried by fill)	Charcoal (*Alnus*)	42	42	440	50	426	491	544	1459	Beta-108719	Bureau of Reclamation 2002	CHAIX
124	ELD, Sand Flat	Natural	Buried soil	SF2-1-8PIB, Bwb3	Wood (*Pinus* bark)	62	62	440	30	461	504	533	1446	Beta-108726	Bureau of Reclamation 2002	CHAIX
125	ELD, Sand Flat	Natural	Buried soil	SF1-4-1PIB, (buried by fill)	Wood (*Pinus* bark scale)	42	42	600	40	539	602	656	1348	Beta-108718	Bureau of Reclamation 2002	CHAIX
126	ELD, Sand Flat	Natural	Surface deposit	SF1-3-1PI, AB	Charcoal (*Pinus*)	32	32	720	40	642	673	729	1277	Beta-108715	Bureau of Reclamation 2002	CHAIX
127	ELD, Sand Flat	Natural	Surface deposit	SF1-2-3AC, Bw2b2	Charcoal (*Arctostaphylos*)	76	76	1110	40	932	1016	1090	934	Beta-108713	Bureau of Reclamation 2002	CHAIX
128	ELD, Sand Flat	Natural	Surface deposit	SF1-4-2PI, Coxb	Charcoal (*Pinus*)	76	76	1540	40	1350	1439	1524	511	Beta-108721	Bureau of Reclamation 2002	CHAIX
129	ELD, Sand Flat	Natural	Surface deposit	SF1-2-3PI, Bw2b2	Charcoal (*Pinus*)	76	76	1630	40	1410	1524	1615	426	Beta-108714	Bureau of Reclamation 2002	CHAIX
130	ELD, Sand Flat	Natural	Buried soil	SF1-1-3-2PIB, 2AB	Wood (*Pinus* bark scale)	44	44	2100	40	1985	2073	2155	-123	Beta-108717	Bureau of Reclamation 2002	CHAIX
131	ELD, Sand Flat	Natural	Buried soil	SF1-4-1PI, Ab (buried by fill)	Charcoal (*Pinus*)	42	42	2220	40	2146	2232	2336	-282	Beta-108720	Bureau of Reclamation 2002	CHAIX
132	ELD, Sand Flat	Natural	Buried soil	AC-1-8TS, Bwb3	Charcoal (*Tsuga*)	150	150	2640	80	2654	2759	2946	-809	Beta-103297	Bureau of Reclamation 2002	CHAIX
133	ELD, Tallac Point	Natural	Submerged	Submerged tree stump/ Ft. 25	Wood	n/a	n/a	4250	200	4241	4810	5324	-2860	LF-605	Harding 1965, Lindstrom 1985, 1990	WATER
134	ELD, Tallac Point	Natural	Submerged	Submerged tree stump	Wood	n/a	n/a	4460	250	4419	5093	5661	-3143	LF-604	Harding 1965, Lindstrom 1990	WATER
135	ELD, Tallac Point	Natural	Submerged	Submerged tree stump/ Ft. 23	Wood	n/a	n/a	4520	60	4972	5162	5321	-3212	Beta-13655	Lindstrom 1985, 1990	WATER
136	ELD, Tallac Point	Natural	Submerged	Submerged tree stump/ Ft. 25	Wood	n/a	n/a	4790	200	4960	5498	5933	-3548	LF-503	Harding 1965, Lindstrom 1985, 1990	WATER
137	ELD, Tallac Point	Natural	Submerged	Submerged tree stump/ Ft. 23	Wood	n/a	n/a	4870	60	5570	5613	5737	-3663	Beta-13654	Lindstrom 1985, 1990	WATER
138	ELD, Taylor Marsh	Natural	Buried marsh	Taylor Creek Marsh Core	Peat	100	105	2860	150	2726	3019	3383	-1069	Beta-13889	Lindstrom 1990	WATAH
139	ELD, Visitor Center Site	Cultural	Surface deposit	Southwest wall of CU 5 (FS-05-19-795-B)	Soil (SOM)	80	90	1660	90	1367	1565	1741	385	Beat-112404	Martin M.A thesis	TALLAC
140	ELD, Visitor Center Site	Cultural	Surface deposit	Southwest wall of CU 5 (FS-05-19-795-A)	Soil (SOM)	60	70	1830	80	1560	1760	1928	190	Beta-112403	Martin M.A thesis	TALLAC
141	ELD-044, White Oak Flat	Cultural	Surface deposit	Trench A, Square 2, by Riddell in 1956	Bone	30	60	2150	190	1713	2146	2549	-196	UCLA-1958	Radiocarbon 1983:135	RESCUE
142	ELD-179	Natural	Surface deposit	Unit 03	Charcoal	20	30	440	80	306	471	560	1479	Beta-34584	Burke et al. 1991	TAHOE
143	ELD-179	Natural	Surface deposit	Unit 07	Charcoal	10	20	770	60	641	708	797	1242	Beta-34585	Burke et al. 1991	TAHOE
144	ELD-180	Natural	Surface deposit	Unit 01	Charcoal	10	20	400	80	291	433	548	1517	Beta-34588	Burke et al. 1991	TALLAC
145	ELD-180	Natural	Surface deposit	Unit 07	Charcoal	40	50	510	70	438	540	659	1410	Beta-34592	Burke et al. 1991	TALLAC
146	ELD-180	Natural	Surface deposit	Unit 07	Charcoal	20	30	540	60	503	562	653	1388	Beta-34591	Burke et al. 1991	TALLAC
147	ELD-180	Natural	Surface deposit	Unit 01	Charcoal	30	40	720	90	533	672	797	1278	Beta-34589	Burke et al. 1991	TALLAC
148	ELD-180	Natural	Surface deposit	Unit 07	Charcoal	10	20	1350	80	1074	1266	1394	684	Beta-34590	Burke et al. 1991	TALLAC
149	ELD-184, Tallac Point	Natural	Surface deposit	Unit 11E	Charcoal	20	30	360	80	282	402	534	1548	Beta-13652	Lindstrom 1985	TALLAC
150	ELD-184, Tallac Point	Natural	Surface deposit	Unit 03	Charcoal	30	40	740	100	539	692	803	1258	Beta-14007	Lindstrom 1985	TALLAC
151	ELD-184, Tallac Point	Natural	Buried Soil	Unit 05 (suggests lower lake level)	Charcoal	80	90	1160	90	930	1088	1273	862	Beta-13653	Lindstrom 1985	TALLAC
152	ELD-201	Cultural	Surface deposit	Unit 02	Charcoal	12	17	510	120	305	529	678	1421	DIC-975	Foster & Bingham 1977	AHWAHNEE
153	ELD-616/H	Cultural	Surface deposit	Unit 02	Charcoal	140	150	1090	100	793	1017	1186	933	Beta-153884	Rosenthal and waechter 2002	BOOMER
154	ELD-616/H	Cultural	Surface deposit	Unit 0, Feat. 1	Charcoal	60	70	1200	80	967	1126	1280	824	Beta-46238	Rosenthal and waechter 2002	BOOMER
156	GLE, Codora, Four Corners	Natural	Buried channel	Older channel next to Little Packer Lake	Wood	780	800	4060	150	4141	4560	4883	-2610	USGS-0666	Price 1982, Sullivan 1982 (Berkeley thesis)	ZAMORA
157	GLE, Little Packer Lake	Natural	Buried channel	Bore LPL-TD1, W of Sac. Rvr, Hwy 45/162 near Cordora	Wood	340	360	830	55	671	750	803	1200	USGS-0665	Price 1982, Sullivan 1982 (Berkeley thesis)	WATER
158	GLE, North of Princeton	Natural	Buried channel	Collected by Mike Dwyer (see LaJoie card file)	Charcoal	3535	3535	40000	> than	na	40000	na	-38050	I-7074	Price 1982	ZAMORA
161	GLE-105, Near Orbend-A	Cultural	Surface deposit	Unit M-13, ETH-3534	Bone (deer)	61	76	2140	230	1686	2137	2731	-187	Beta-023316	Bayham and Johnson 1990; White 2004	TEHAMA
162	GLE-105, Near Orbend-B	Cultural	Surface deposit	Unit 0-14, Spec. No. 2	Bone (deer)	76	91	2550	85	2360	2601	2778	-651	Beta-025576	Bayham and Johnson 1990; White 2004	TEHAMA
163	GLE-105, Near Orbend-B	Cultural	Surface deposit	Unit 0-14, Spec. No. 3	Bone (elk)	15	30	7770	105	8382	8570	8794	-6620	Beta-025577	Bayham and Johnson 1990; White 2004	TEHAMA
167	GLE-217, Elk Creek	Cultural	Surface deposit	Locus A grading, Strat. I, AC	Bone (human)	10	30	1780	70	1547	1703	1866	247	Beta-041676	White and Weigel 2006	TEHAMA
168	GLE-217, Elk Creek	Cultural	Surface deposit	Locus A, Unit 2, Strat. II	Bone (human)	50	80	2640	110	2362	2747	2967	-797	Beta-042318	White and Weigel 2006	TEHAMA
169	GLE-217, Elk Creek	Cultural	Surface deposit	Locus A, Unit 2, Strat. II rock layer	Bone (human)	40	70	2980	70	2962	3161	3348	-1211	Beta-041475	White and Weigel 2006	TEHAMA
170	GLE-217, Elk Creek	Cultural	Surface deposit	Locus A grading, near Unit 4, Strat. II	Bone (human)	30	60	2990	90	2925	3169	3381	-1219	Beta-041677	White and Weigel 2006	TEHAMA
171	NEV, Donner Lake	Natural	Submerged	Submerged tree stump	Wood	n/a	n/a	150	50		150	286	1800	Beta-87324	Lindstrom 2000	WATER
172	NEV, Donner Lake	Natural	Submerged	Submerged tree stump	Wood	n/a	n/a	469	60	464	511	550	1439	Beta-70014	Lindstrom 2000	WATER
173	NEV, Donner Lake	Natural	Submerged	Submerged tree stump	Wood	n/a	n/a	490	50	500	525	548	1425	Beta-70013	Lindstrom 2000	WATER
174	NEV, FS-05-17-57-73	Natural	Surface deposit	Unit 94, Feature 3, east of Alder Hill near Truckee, CA	Charcoal	25	30	660	50	561	616	669	1334	Beta-3834	Elston, Hardesty, Zeier 1982	ALDI-KYBURZ

Appendix A: Radiocarbon Database

Map No.	County, Area or Site	Context	Deposit	Provenience	Material	Min. Depth cm	Max. Depth cm	14C B.P.	+/-	Min. Cal BP	Cal B.P.	Max. Cal BP	AD/-BC	Lab. No.	Reference	Soil Series Name
175	NEV, Independence Lake	Natural	Submerged	Submerged tree stump	Wood	n/a	n/a	170	50	59	169	234	1781	Beta-32856	Lindstrom 2000	WATER
176	NEV, Independence Lake	Natural	Submerged	Submerged tree stump	Wood	n/a	n/a	690	50	641	649	681	1301	Beta-32857	Lindstrom 2000	WATER
177	NEV, Independence Lake	Natural	Submerged	Submerged tree stump	Wood	n/a	n/a	100	mod	na	100	na	1850	Beta-32855	Lindstrom 2000	WATER
178	NEV-013/H	Cultural	Surface deposit	Locus F/G, F2 Hearth	Charcoal	2.5	22	950	50	742	855	937	1095	Beta-207008	Lindstrom 2007	CELIO-GEFO-AQUOLLS
179	NEV-013/H	Cultural	Surface deposit	Locus F/G, F1 Hearth	Charcoal	25	40	1270	60	1064	1201	1294	749	Beta-207007	Lindstrom 2007	CELIO-GEFO-AQUOLLS
180	NEV-015, Childers Site	Cultural	Surface deposit	21-SE-27	Charcoal	30	60	280	40	282	370	465	1580	UCLA-1951B	Radiocarbon Vol. 25 (1) 1983	CHAIX-HOTAW
181	NEV-015, Childers Site	Cultural	Surface deposit	Unstratified midden	Charcoal	30	40	610	150	309	599	799	1351	M-0937	Price 1982 (#62) Radiocarbon 1961	CHAIX-HOTAW
182	NEV-015, Childers Site	Cultural	Surface deposit	16-SW-23	Charcoal	30	60	1950	60	1729	1900	2009	50	UCLA-1951A	Radiocarbon Vol. 25 (1) 1983	CHAIX-HOTAW
183	NEV-021	Natural	Surface deposit	Charcoal from lower biomantle contact.	Charcoal	16.5	19	550	50	509	573	651	1377	Beta-200359	McGuire et al. 2006	MARTIS-EUER
184	NEV-021	Natural	Surface deposit	Bulk soil sample from Stratum 1 (A/Bt)	Soil (SOM)	10	25	720	60	620	671	744	1279	Beta-200355	McGuire et al. 2006	MARTIS-EUER
185	NEV-021	Natural	Buried soil	Bulk soil sample from Stratum 2 (lower biomantle [2A])	Soil (SOM)	25	40	1000	60	778	909	1013	1041	Beta-200356	McGuire et al. 2006	MARTIS-EUER
186	NEV-021	Natural	Buried soil	Bulk soil sample from Stratum 3 (unaltered Prosser Al)	Soil (SOM)	50	50	1550	50	1341	1448	1540	502	Beta-200358	McGuire et al. 2006	MARTIS-EUER
187	NEV-021	Natural	Buried soil	Bulk soil sample from Stratum 3 (paleosol 3A/3Bt)	Soil (SOM)	40	50	2150	60	1996	2148	2318	-198	Beta-200357	McGuire et al. 2006	MARTIS-EUER
188	NEV-120	Cultural	Buried soil	Unit 03, in-situ	Charcoal	60	70	2800	170	2665	2951	3372	-1001	Beta-26374	Peak 1988	EUER-AQUOLLS
189	NEV-182/H	Natural	Surface deposit	Unit 13	Soil (SOM)	40	60	4090	40	4512	4604	4711	-2654	Beta-218876	Lindstrom and Waechter 2007	INVILLE-RIVERWASH
190	NEV-194	Cultural	Surface deposit	Feature 5	Charcoal	30	40	3230	220	2872	3459	3983	-1509	UCLA-2391A	Clewlow 1984	BOOMER-ROCK OUTCROP
191	NEV-194	Cultural	Surface deposit	Feature 5	Charcoal	30	40	3775	230	3613	4164	4822	-2214	UCLA-2391B	Clewlow 1984	BOOMER-ROCK OUTCROP
192	NEV-199	Cultural	Surface deposit	S11-E2B	Charcoal	10	20	115	80	-5	138	159	1812	75-2187	Rondeau 1982	EUER-MARTIS
193	NEV-199	Cultural	Surface deposit	S7-W5B	Charcoal	60	80	245	75	244	285	484	1665	75-2190	Rondeau 1982	EUER-MARTIS
194	NEV-199	Cultural	Surface deposit	S11-E2B	Charcoal	40	50	340	95	262	385	541	1565	75-2188	Rondeau 1982	EUER-MARTIS
195	NEV-199	Cultural	Surface deposit	S11-E14B	Charcoal	40	60	400	85	286	432	555	1518	75-2192	Rondeau 1982	EUER-MARTIS
196	NEV-199	Cultural	Surface deposit	S11-E2B	Charcoal	100	110	455	140	267	467	683	1483	75-2185	Rondeau 1982	EUER-MARTIS
197	NEV-199	Cultural	Surface deposit	S11-E2B, from semi-circle of FCR	Charcoal	80	90	880	110	651	812	988	1138	75-2186	Rondeau 1982	EUER-MARTIS
198	NEV-407	Cultural	Surface deposit	Unit 35	Charcoal	30	30	<300		284	382	488	1568	2390C	Clewlow 1984	SITES
199	NEV-407	Cultural	Surface deposit	Unit 29	Charcoal	20	20	<300		284	382	488	1568	2390F	Clewlow 1984	SITES
200	NEV-407	Cultural	Surface deposit	Unit 25, pine bark concentration	Charcoal (pine bark)	30	30	<300		284	382	488	1568	2390G	Clewlow 1984	SITES
201	NEV-407	Cultural	Surface deposit	Unit 30	Charcoal	42	42	1290	250	724	1201	1707	749	2390A	Clewlow 1984	SITES
202	NEV-407	Cultural	Surface deposit	Unit 33, carbonized post	Charcoal	10	10	2255	250	1694	2275	2853	-325	2390H	Clewlow 1984	SITES
203	NEV-407	Cultural	Surface deposit	Unit 35	Charcoal	60	60	2570	280	1992	2646	3351	-696	2390D	Clewlow 1984	SITES
204	NEV-407	Cultural	Surface deposit	Unit 30, from base of midden	Charcoal	85	85	2730	250	2304	2859	3452	-909	2390B	Clewlow 1984	SITES
205	NEV-407	Cultural	Surface deposit	Unit 35, from base of midden	Charcoal	90	90	3125	270	2724	3325	3995	-1375	2390E	Clewlow 1984	SITES
206	NEV-884/H	Natural	Buried soil	Prosser Al, sub-erratic soil feature	Soil (SOM)	45	60	2480	40	2433	2568	2719	-618	Beta-200354	McGuire et al. 2006	KYBURZ-ROCK OUTCROP
207	NEV-884/H	Natural	Buried soil	Vitric charcoal from profile sample Grays Paleosol.	Charcoal	70	90	8000	60	8681	8861	9013	-6911	Beta-200353	McGuire et al. 2006	ALDI-KYBURZ
208	PLA, Auburn area	Natural	Surface deposit	USBR trench BHT-64	Wood	90	90	270	55	268	338	483	1612	USGS-0211	Harden and Marchand 1979; Price 1982 (#370)	SIERRA
209	PLA, Auburn area	Natural	Surface deposit	USBR trench BHT-1A	Charcoal	30	50	300	40	395	406	423	1544	USGS-0191	Harden and Marchand 1979; Price 1982 (#369)	SIERRA
210	PLA, Auburn area	Natural	Surface deposit	SW of Bayley House, pit 7	Charcoal (with soil)	80	80	385	100	269	414	561	1536	W-1687	Price 1982 (#355)	SIERRA
211	PLA, Auburn area	Natural	Surface deposit	SW of Bayley House, pit 7	Charcoal	60	60	760	100	551	710	833	1240	W-1686	Price 1982 (#354)	SIERRA
212	PLA, Auburn area	Natural	Surface deposit	Bayley House, pit 7, C horizon of surface deposit	Charcoal	240	240	9130	170	9736	10310	10734	-8360	WSU-1683	Borchardt et al. 1980; Price 1982 (#353)	ANDREGG-SHENANDOAH
213	PLA, Auburn Dam	Natural	Buried Soil	S. wall of Hubbard Rd. trench	Charcoal	?	?	1710	60	1515	1621	1744	329	USGS-0221	Radiocarbon, vol. 23, No. 2, 1981	AUBURN-ARGONAUT-ROCK
214	PLA, Bunker Lake	Natural	Submerged	Lake bottom core sample, below 9.2 m of water	Charcoal	217	227	5620	90	6277	6413	6637	-4463	Beta-56112	Edlund, Chapter 6, 1994	TALLAC
215	PLA, Bunker Lake	Natural	Submerged	Lake bottom core sample, below 9.2 m of water	Charcoal	344	352	9560	150	10492	10890	11242	-8940	Beta-56113	Edlund, Chapter 6, 1994	TALLAC
216	PLA, Bunker Lake	Natural	Submerged	Lake bottom core sample, below 9.2 m of water	Charcoal	385	395	11180	180	12839	13088	13372	-11138	Beta-56114	Edlund, Chapter 6, 1994	TALLAC
217	PLA, FS-05-17-57-209	Natural	Surface deposit	Martis Valley, east of Joerger Ranch	Charcoal (tree root?)	30	30	2310	60	2176	2325	2363	-375	Beta-3835	Elston, Hardesty, Zeier 1982	AQUOLLS AND BOROLLS
218	PLA, Orr Creek	Natural	Surface deposit	Creek bank?	Charcoal	60	60	100	10	88	119	256	1831	WSU-1685	Price 1982 (#352)	AUBURN-ARGONAUT-ROCK
219	PLA, Squaw Valley	Natural	Surface deposit	CME 6.5S/44W Strata 4 (FS-05-57-256); caps buried site	Charcoal	0	30	1140	50	953	1052	1176	898	Beta-110284	Duke 1998	TALLAC-CRYUMBREPTS
220	PLA, Squaw Valley	Natural	Surface deposit	CME 6.5S/44W Strata 4 (FS-05-57-256); caps buried site	Charcoal	0	30	1260	50	1072	1200	1285	750	Beta-110285	Duke 1998	TALLAC-CRYUMBREPTS
221	PLA-005	Cultural	Surface deposit	GG2-4-1	Charcoal	60	80	310	50	288	386	493	1564	Beta-107833	Summit and Pacific Legacy 1999	MARTIS-EUER
222	PLA-005	Cultural	Surface deposit	X7-2-1	Charcoal	10	20	1170	60	961	1095	1187	855	Beta-107832	Summit and Pacific Legacy 1999	MARTIS-EUER
223	PLA-005	Cultural	Surface deposit	V7-5-3-1	Charcoal	40	50	1320	60	1122	1242	1338	708	Beta-107831	Summit and Pacific Legacy 1999	MARTIS-EUER
224	PLA-005	Cultural	Surface deposit	W8-4-1-10	Charcoal	30	40	1840	100	1540	1769	1991	181	Beta-107830	Summit and Pacific Legacy 1999	MARTIS-EUER
225	PLA-005	Cultural	Surface deposit	F1-4-2-1	Charcoal	30	40	2210	60	2098	2223	2345	-273	Beta-107828	Summit and Pacific Legacy 1999	MARTIS-EUER
226	PLA-005	Natural	Surface deposit	T3b-8-2-1	Soil (SOM)	80	90	2350	70	2299	2408	2547	-458	Beta-99282	Summit and Pacific Legacy 1999	MARTIS-EUER
227	PLA-005	Natural	Surface deposit	T3b-9-2-1	Soil (SOM)	90	100	2740	80	2739	2854	3063	-904	Beta-107835	Summit and Pacific Legacy 1999	MARTIS-EUER
228	PLA-005	Natural	Surface deposit	T3b-10-2-1	Soil (SOM)	90	100	2750	80	2743	2864	3067	-914	Beta-99280	Summit and Pacific Legacy 1999	MARTIS-EUER
229	PLA-005	Cultural	Surface deposit	GG2-5-1	Charcoal	80	100	2840	60	2792	2959	3083	-1009	Beta-107834	Summit and Pacific Legacy 1999	MARTIS-EUER

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Map No.	County, Area or Site	Context	Deposit	Provenience	Material	Min. Depth cm	Max. Depth cm	14C B.P.	+/-	Min. Cal BP	Cal B.P.	Max. Cal BP	AD/-BC	Lab. No.	Reference	Soil Series Name
230	PLA-005	Cultural	Surface deposit	A1-6-1-3	Charcoal	50	60	3240	90	3319	3474	3689	-1524	Beta-107825	Summit and Pacific Legacy 1999	MARTIS-EUER
231	PLA-005	Cultural	Surface deposit	B1-7-1-2	Charcoal	60	70	3860	90	4068	4275	4451	-2325	Beta-107826	Summit and Pacific Legacy 1999	MARTIS-EUER
232	PLA-005	Natural	Surface deposit	Trench 5, Unit A, T2a-7-1-5	Soil (SOM)	120	140	4050	80	4400	4558	4827	-2608	Beta-99281	Summit and Pacific Legacy 1999	MARTIS-EUER
233	PLA-005	Cultural	Surface deposit	C3-9-2-1	Charcoal	80	90	4060	150	4141	4560	4883	-2610	Beta-107827	Summit and Pacific Legacy 1999	MARTIS-EUER
234	PLA-005	Natural	Buried soil	Trench T2A-7-1-4	Charcoal	126	126	4160	60	4529	4694	4837	-2744	Beta-99279	Summit and Pacific Legacy 1999	MARTIS-EUER
235	PLA-005	Cultural	Surface deposit	M8-4-2-1	Charcoal	30	40	5120	70	5698	5850	5997	-3900	Beta-107829	Summit and Pacific Legacy 1999	MARTIS-EUER
236	PLA-006	Cultural	Surface deposit	B1-3-1-5	Charcoal	20	30	100	40	11	115	149	1835	Beta-114827	Summit and Pacific Legacy 1999	KYBURZ-TROJAN
237	PLA-006	Cultural	Surface deposit	Cutbank 2 profile, M1-3-1-2	Charcoal	30	40	1370	40	1238	1295	1351	655	Beta-98465	Summit and Pacific Legacy 1999	KYBURZ-TROJAN
238	PLA-006	Natural	Buried soil	Cutbank 2 profile, 2-2	Charcoal	55	65	2900	50	2921	3044	3209	-1094	Beta-107837	Summit and Pacific Legacy 1999	KYBURZ-TROJAN
239	PLA-006	Natural	Buried soil	Cutbank 2 profile, 2-1	Charcoal	110	120	4180	50	4570	4713	4844	-2763	Beta-107836	Summit and Pacific Legacy 1999	KYBURZ-TROJAN
240	PLA-023	Natural	Surface deposit	Unit 04, Sandy pebble loam	Charcoal	20	30	160	60	56	159	295	1791	Tx-2471	Elston et al. 1977	TALLAC
241	PLA-023	Natural	Buried soil	A horizon, sandy silt, "limiting age of buried surface"	Charcoal	25	25	1000	50	788	913	989	1037	Tx-2474	Elston et al. 1977	TALLAC
242	PLA-023	Natural	Buried deposit	Unit 03, sandy, pebble loam	Charcoal	50	60	3290	60	3387	3522	3641	-1572	Tx-2473	Elston et al. 1977	TALLAC
243	PLA-023	Natural	Buried soil	B Horizon, sandy silt, top of Tahoe-age deposit	Charcoal	40	50	4600	80	5039	5304	5483	-3354	Tx-2472	Elston et al. 1977	TALLAC
244	PLA-101	Cultural	Surface deposit	Unit 3S/5E	Charcoal	30	40	911	80	688	830	956	1120	GaK-2244	Ritter 1970	AIKEN
245	PLA-101	Cultural	Surface deposit	Unit 3S/5E	Charcoal	50	60	974	90	721	876	1059	1074	GaK-2245	Ritter 1970	AIKEN
246	PLA-101	Cultural	Surface deposit	Unit 1N/12E, base of midden, above buried soil	Charcoal	90	100	3350	110	3365	3597	3860	-1647	GaK-2246	Ritter 1970	AIKEN
247	PLA-163	Cultural	Surface deposit	Feat 1 (F1)	Charcoal	5	32	430	40	428	491	536	1459	Beta-150763	Lindstrom 2005?	TALLAC
248	PLA-163	Cultural	Surface deposit	Feat 1 (F1)	Charcoal	5	32	860	40	689	771	803	1179	Beta-147583	Lindstrom 2005?	TALLAC
249	PLA-164	Natural	Surface deposit	Stratum 4 and 5	Charcoal	50	100	330	90	265	381	532	1569	Tx-2547	Elston et al. 1977	TALLAC
250	PLA-164	Natural	Surface deposit	Units 04 and 05, sandy pebble loam, in situ	Charcoal	50	100	1210	70	1044	1136	1280	814	Tx-2543	Elston et al. 1977	TALLAC
251	PLA-164	Natural	Surface deposit	Units 04 and 05, sandy pebble loam	Charcoal	50	100	1310	70	1067	1227	1337	723	Tx-2544	Elston et al. 1977	TALLAC
252	PLA-164	Natural	Surface deposit	Unit 04, Sandy pebble loam	Charcoal	50	100	2170	70	2002	2178	2333	-228	Tx-2545	Elston et al. 1977	TALLAC
253	PLA-164	Natural	Buried soil	Orange sand	Charcoal	100	150	4300	290	4138	4878	5595	-2928	Tx-2546	Elston et al. 1977	TALLAC
254	PLA-164	Natural	Buried soil	Mottled silt, with mineralized wing bone of large bird	Charcoal	130	180	8130	130	8693	9071	9422	-7121	Tx-2548	Elston et al. 1977	TALLAC
255	PLA-165	Cultural	Surface deposit	Feat 10, hearth	Charcoal	28	45	2050	40	1922	2015	2122	-65	Beta-150762	Lindstrom 2005?	TALLAC
256	PLA-165	Cultural	Surface deposit	Feat 9, hearth	Charcoal	29	45	2240	40	2152	2234	2279	-284	Beta-150761	Lindstrom 2005?	TALLAC
257	PLA-165	Cultural	Surface deposit	Feat 8, hearth	Charcoal	20	50	2770	40	2777	2865	2957	-915	Beta-133918	Lindstrom 2005?	TALLAC
258	PLA-272	Cultural	Surface deposit	Three units	Charcoal	31	46	260	140	55	289	506	1661	UCR-1610	Johnson: UCR 1986	KYBURZ-TROJAN
259	PLA-272	Cultural	Surface deposit	N64/E45	Charcoal (wood)	15	31	540	85	438	563	674	1387	UCR-1612	Johnson: UCR 1986	KYBURZ-TROJAN
260	PLA-272	Cultural	Surface deposit	Two units	Charcoal	31	46	1490	140	1166	1406	1710	544	UCR-1611	Johnson: UCR 1986	KYBURZ-TROJAN
261	PLA-695/H	Cultural	Surface deposit	Locus 1, Unit A/AA	Charcoal	70	80	1270	80	1050	1191	1311	759	Beta-94048	Baker 2000	MARIPOSA
262	PLA-695/H	Cultural	Surface deposit	Locus 1, Unit A/AA	Charcoal	80	90	1320	60	1122	1242	1338	708	Beta-94043	Baker 2000	MARIPOSA
263	PLA-695/H	Cultural	Surface deposit	Locus 1, Unit Q	Charcoal	130	140	1340	60	1167	1263	1359	687	Beta-094046	Baker 2000	MARIPOSA
264	PLA-695/H	Cultural	Surface deposit	Locus 1, Unit A/AA	Charcoal	50	60	1560	80	1302	1458	1615	492	Beta-94047	Baker 2000	MARIPOSA
265	PLA-695/H	Cultural	Surface deposit	Locus 1, Unit F	Charcoal	70	80	2170	70	2002	2178	2333	-228	Beta-094044	Baker 2000	MARIPOSA
266	PLA-695/H	Cultural	Surface deposit	Locus 4, Unit N	Charcoal	80	90	3680	160	3611	4030	4439	-2080	Beta-94045	Baker 2000	MARIPOSA
267	PLA-728/H	Cultural	Surface deposit	Unit 3N/26E, Burial 4	Charcoal	50	60	100	80	-6	132	155	1818	Beta-117788	Baker 2000	MARIPOSA-JOSEPHINE
268	PLA-728/H	Cultural	Surface deposit	Unit 3N/25E, Feat. A	Charcoal	60	70	160	60	56	159	295	1791	Beta-117787	Baker 2000	MARIPOSA-JOSEPHINE
269	PLA-728/H	Cultural	Surface deposit	Unit 3N/26E, Feat. 3	Charcoal	50	80	290	40	285	380	467	1570	Beta-116926	Baker 2000	MARIPOSA-JOSEPHINE
270	PLA-728/H	Cultural	Surface deposit	Unit 3N/27E, Burial 3	Charcoal	60	70	360	70	292	405	518	1545	Beta-117789	Baker 2000	MARIPOSA-JOSEPHINE
271	PLU, Mohawk Valley	Natural	Buried deposit	Cutbank along Middle Feather River?	Wood (log)	?	?	18715	235	21435	22255	22768	-20305	?	Yount, Harwood, and Bradbury 1993	INVILLE-WOODSEYE
272	SAC, Andrus Island	Natural	Buried marsh	Andrus Island (UCD 12)	Peat	910	910	4675	200	4851	5359	5755	-3409	GX-2579	Shlemon & Begg 1975	RINDGE
273	SAC, Delta Meadows	Natural	Surface deposit	Delta Meadows Core 1, north of Locke, CA	Peat	20	22	120.2	0.4 pMC	7	129	151	1821	Beta-160030	Brown and Pasternack 2004a, b	VALPAC
274	SAC, Delta Meadows	Natural	Buried marsh	Delta Meadows Core 1, north of Locke, CA	Organic sediment	202	204	3190	40	3341	3414	3480	-1464	Beta-160031	Brown and Pasternack 2004a, b	VALPAC
275	SAC, Dry Creek	Natural	Unknown	Creek bank?	Wood	100	100	2215	110	1924	2211	2488	-261	UM-2147	Price 1982 (#175); Marchand 1980 written com.	SAILBOAT
276	SAC, Dry Creek	Natural	Buried soil	Stratum I, 2ABtb, south cutbank	Soil (SOM)	150	170	3280	50	3399	3511	3630	-1561	Beta-185711	Rosenthal and Meyer 2004 (in progress)	SAILBOAT
277	SAC, Dry Creek	Natural	Buried deposit	Creek bank?	Wood	450	450	38630	> than	na	38630	na	-36680	UM-2148	Price 1982 (#175); Marchand 1980	SAILBOAT
278	SAC, East of Locke	Natural	Surface deposit	McCormack-Williamson Tract Core 8	Organic sediment	80	90	710	40	637	667	726	1283	Beta-160027	Brown and Pasternack 2004a	EGBERT
279	SAC, East of Locke	Natural	Buried marsh	McCormack-Williamson Tract Core 8	Peat	540	550	4290	50	4809	4861	4977	-2911	Beta-160028	Brown and Pasternack 2004a	EGBERT
280	SAC, East of Locke	Natural	Buried marsh	McCormack-Williamson Tract Core 8	Wood (in peat)	1040	1050	4970	50	5598	5701	5762	-3751	Beta-151652	Brown and Pasternack 2004a	EGBERT
281	SAC, East of Locke	Natural	Buried soil	McCormack-Williamson Tract Core 6	Organic sediment	370	380	5730	50	6409	6528	6642	-4578	Beta-160025	Brown and Pasternack 2004a	EGBERT
282	SAC, East of Locke	Natural	Buried soil	McCormack-Williamson Tract Core 6	Organic sediment	690	700	7700	60	8400	8489	8591	-6539	Beta-160026	Brown and Pasternack 2004a	EGBERT
283	SAC, East of Locke	Natural	Buried soil	McCormack-Williamson Tract Core 6	Organic sediment	1290	1300	8630	40	9533	9585	9678	-7635	Beta-151651	Brown and Pasternack 2004a	EGBERT
284	SAC, East of Locke	Natural	Buried soil	McCormack-Williamson Tract Core 2	Organic sediment	1060	1070	12420	90	14110	14468	14911	-12518	Beta-160023	Brown and Pasternack 2004a	EGBERT

Appendix A: Radiocarbon Database

Map No.	County, Area or Site	Context	Deposit	Provenience	Material	Min. Depth cm	Max. Depth cm	14C B.P.	+/-	Min. Cal BP	Cal B.P.	Max. Cal BP	AD/-BC	Lab. No.	Reference	Soil Series Name
285	SAC, East of Locke	Natural	Buried soil	McCormack-Williamson Tract Core 8	Organic sediment	1210	1220	15890	100	18907	19081	19323	-17131	Beta-160029	Brown and Pasternack 2004a	EGBERT
286	SAC, East of Locke	Natural	Buried deposit	McCormack-Williamson Tract Core 2	Organic sediment	420	430	20160	170	23692	24136	24565	-22186	Beta-160022	Brown and Pasternack 2004a	EGBERT
287	SAC, East of Locke	Natural	Buried soil	McCormack-Williamson Tract Core 2	Organic sediment	1260	1270	40100	1010	na	40100	na	-38150	Beta-151650	Brown and Pasternack 2004a	EGBERT
288	SAC, East of Locke	Natural	Buried soil	McCormack-Williamson Tract Core 2	Organic sediment	1070	1080	23550	210	na	23550	na	-21600	Beta-160024	Brown and Pasternack 2004a	EGBERT
290	SAC, Natomas, W of I-5	Natural	Buried deposit	Below floodbasin; Columbia/Sacramento soil	Wood	335	335	2940	140	2776	3105	3399	-1155	Beta-002344	Atwater 1982; Price 1982 (#480)	SAILBOAT
291	SAC, Sacramento	Natural	Buried deposit	Federal Courthouse, Block HI56, Core 1	Wood	1540	1540	1110	50	931	1021	1141	929	Beta-103621	West 1998	URBAN LAND
292	SAC, Sand Cove	Natural	Buried deposit	Core 5, north of SAC-164	Charcoal	777	823	3200	80	3249	3429	3619	-1479	Beta-??	Tremaine ??	SAILBOAT
293	SAC, Sherman Island	Natural	Buried marsh	W. Sherman Is. (UCD 15)	Peat	610	610	3900	140	3963	4327	4709	-2377	GX-2582	Shlemon & Begg 1975	FLUVAQUENTS
294	SAC, Sherman Island	Natural	Buried marsh	Sherman Island (UCD 08)	Peat	910	910	4340	195	4422	4948	5338	-2998	GX-2575	Shlemon & Begg 1975	GAZWELL
295	SAC, Sherman Island	Natural	Buried marsh	W. Sherman Is. (UCD 01)	Peat	1010	1010	6600	250	6949	7477	7948	-5527	W-0794	Shlemon & Begg 1975	RINDGE
296	SAC, Sherman Island	Natural	Buried marsh	Sherman Island (UCD 09)	Peat	1220	1220	6635	320	6795	7501	8056	-5551	GX-2576	Shlemon & Begg 1975	GAZWELL
297	SAC, Sherman Island	Natural	Buried marsh	Sherman Island (UCD 10)	Peat	1520	1520	6805	350	6954	7668	8351	-5718	GX-2577	Shlemon & Begg 1975	GAZWELL
298	SAC, Sherman Island	Natural	Buried soil	Sherman Island (UCD 11)	Organic sediment	1700	1700	10475	500	10768	12177	13270	-10227	GX-2578	Shlemon & Begg 1975	GAZWELL
299	SAC, Sherman Island	Natural	Buried soil	W. Sherman Is. (UCD 02)	Organic sediment	1770	1770	10690	300	11690	12540	13208	-10590	W-0744	Shlemon & Begg 1975	RINDGE
300	SAC, Steamboad Landing	Natural	Buried marsh	East of Sacramento River	Peat (firm)	230	230	1910	55	1717	1853	1951	97	USGS-0749	Atwater 1982; Price 1981	COLUMBIA
301	SAC, Twitchell Island	Natural	Buried marsh	Twitchell Island (UCD 16)	Peat	610	610	3090	190	2791	3276	3700	-1326	GX-2583	Shlemon & Begg 1975	WATER
302	SAC-006, Johnson	Cultural	Surface deposit	Burial 67	Charcoal	117	117	620	200	270	604	965	1346	M-0648	Heizer 1958	BRUELLA
303	SAC-006, Johnson	Cultural	Surface deposit	Housepost	Charcoal	122	122	2410	200	1967	2471	2888	-521	C-0691	Heizer 1958	BRUELLA
304	SAC-021, Hollister	Cultural	Surface deposit	Burials 24 & 28	Charcoal (wood)	61	66	250	150	-3	278	503	1672	M-0885	Price 1982	DIERSSEN
305	SAC-021, Hollister	Cultural	Surface deposit	Burial 33	Charcoal (wood/basketry)	137	137	510	150	269	519	742	1431	M-0866	Price 1982	DIERSSEN
306	SAC-021, Hollister	Cultural	Surface deposit	Collected by Fenega 1939	Bone (canis f.)	15	15	700	90	525	656	792	1294	UCR-1174	Langenwalter UCR 1986	DIERSSEN
307	SAC-021, Hollister	Cultural	Surface deposit	Collected by Fenega 1939	Bone (canis f.)	61	61	830	70	669	759	835	1191	UCR-1175	Langenwalter UCR 1986	DIERSSEN
308	SAC-021, Hollister	Cultural	Surface deposit	Burial 18	Bone (human)	46	46	900	150	630	836	1096	1114	UCR-0198	Schilz 1981:243	DIERSSEN
309	SAC-021, Hollister	Cultural	Surface deposit	Burial 32	Charcoal	30	30	780	750	-6	900	2156	1050	UCR-0337	Schulz 198:243	DIERSSEN
310	SAC-021, Hollister	Cultural	Surface deposit	Burial 17	Bone (human)	63	63	980	150	665	903	1184	1047	UCR-0199	Schulz 1981:243	DIERSSEN
313	SAC-029, King Brown Site	Cultural	Buried deposit	Burial 123 pit, coiled basket	Charcoal (wood, basket)	282	282	1750	500	688	1736	2792	214	M-0752	Radiocarbon 1959; Breschini et al. 1996	SAILBOAT-URBAN
314	SAC-034, Sutter Fort	Cultural	Surface deposit	Burial 09	Bone (human)	60	60	1850	150	1415	1783	2127	167	UCR-0138	Price 1982 (#149); Taylor 1975; Riddell ?	ROSSMOOR-URBAN LAND
315	SAC-034, Sutter Fort	Cultural	Surface deposit	Burial 23	Bone (human)	117	117	2000	150	1686	1967	2334	-17	UCR-0194	Schulz 1981 in Breschini et al. 1996	ROSSMOOR-URBAN LAND
316	SAC-042, Souza	Cultural	Buried soil	Feature 4, cooking/refuse pit	Bone (deer antler)	120	120	1070	50	908	985	1089	965	Beta-76508	Milliken 1995	VALPAC
317	SAC-042, Souza	Cultural	Buried soil	Trench 1b, Feature 3, base of cooking/refuse pit	Bone (elk calcaneous)	190	190	1430	60	1261	1337	1419	613	Beta-77561	Milliken 1995	VALPAC
318	SAC-042, Souza	Cultural	Buried soil	Midden core profile	Charcoal	265	265	1430	100	1168	1344	1548	606	Beta-009578	Peak & Ass. 1984	VALPAC
319	SAC-042, Souza	Cultural	Surface deposit	Midden core profile	Charcoal	95	95	2040	60	1871	2005	2150	-55	Beta-009577	Peak & Ass. 1984	VALPAC
320	SAC-042, Souza	Cultural	Buried soil	Trench 1a, Feature 1	Charcoal	135	155	2370	80	2302	2442	2715	-492	Beta-76506	Milliken 1995	VALPAC
321	SAC-043, Brazil	Cultural	Surface deposit	S78/E28, Burial 63	Bone (human)	62.5	62.5	620	55	537	603	669	1347	AA-10623	Bouey 1995	VALPAC
322	SAC-043, Brazil	Cultural	Surface deposit	S07/E16, Burial 69	Bone (human)	63	63	780	130	533	733	935	1217	UCR-220	Bouey 1995	VALPAC
323	SAC-043, Brazil	Cultural	Surface deposit	S18/E11, Burial 28	Bone (human)	78	78	835	50	674	752	803	1198	AA-9882	Bouey 1995	VALPAC
324	SAC-043, Brazil	Cultural	Surface deposit	S04/E29, Burial 36	Bone (human)	90	90	980	150	665	903	1184	1047	UCR-0228	Bouey 1995	VALPAC
325	SAC-043, Brazil	Cultural	Surface deposit	N17/E16, Burial 14	Bone (human)	105	105	1080	150	730	1006	1286	944	UCR-227	Bouey 1995	VALPAC
326	SAC-043, Brazil	Cultural	Surface deposit	S05/E08, Burial 50	Bone (human)	90	90	1140	150	759	1064	1308	886	UCR-0230	Bouey 1995	VALPAC
327	SAC-043, Brazil	Cultural	Surface deposit	N22/E35, Burial 25	Bone (human)	83	83	1170	150	782	1091	1348	859	UCR-222	Bouey 1995	VALPAC
328	SAC-043, Brazil	Cultural	Surface deposit	N40/E41, Burial 12	Bone (human)	75	75	1320	150	936	1222	1521	728	UCR-217	Bouey 1995	VALPAC
329	SAC-043, Brazil	Cultural	Surface deposit	S10/E11, Burial 48	Bone (human)	95	95	1355	150	956	1260	1552	690	UCR-229	Bouey 1995	VALPAC
330	SAC-043, Brazil	Cultural	Surface deposit	N07/E23, Burial 32	Bone (human)	85	85	1390	85	1167	1306	1423	644	AA-9883	Bouey 1995	VALPAC
331	SAC-043, Brazil	Cultural	Surface deposit	S04/E34, Burial 10	Bone (human)	40	40	1445	55	1278	1346	1418	604	AA-10619	Bouey 1995	VALPAC
332	SAC-043, Brazil	Cultural	Surface deposit	N24/E26, Burial 29	Bone (human)	65	65	1455	60	1281	1355	1423	595	AA-10618	Bouey 1995	VALPAC
333	SAC-043, Brazil	Cultural	Surface deposit	N06/E13, Burial 13	Bone (human)	88	88	1465	60	1287	1363	1424	587	AA-9880	Bouey 1995	VALPAC
334	SAC-043, Brazil	Cultural	Surface deposit	N15/E28, Burial 31	Bone (human)	95	95	1510	55	1309	1401	1520	549	AA-10621	Bouey 1995	VALPAC
335	SAC-043, Brazil	Cultural	Surface deposit	N09/E09, Burial 21	Bone (human)	83	83	1630	50	1402	1523	1627	427	AA-9881	Bouey 1995	VALPAC
336	SAC-043, Brazil	Cultural	Surface deposit	N47/E25, Burial 38	Bone (human)	85	85	1695	55	1507	1605	1729	345	AA-10622	Bouey 1995	VALPAC
337	SAC-043, Brazil	Cultural	Surface deposit	N08/E21, Burial 39	Bone (human)	75	75	1710	50	1517	1621	1739	329	AA-9884	Bouey 1995	VALPAC
338	SAC-043, Brazil	Cultural	Surface deposit	N17/E16, Burial 14	Bone (human)	105	105	1760	60	1541	1674	1821	276	AA-10620	Bouey 1995	VALPAC
339	SAC-043, Brazil	Cultural	Surface deposit	S02/E20, Burial 73	Bone (human)	63	63	1790	75	1543	1715	1877	235	AA-9887	Bouey 1995	VALPAC
340	SAC-043, Brazil	Cultural	Surface deposit	N47/E33, Burial 65	Bone (human)	32.5	32.5	1815	50	1683	1751	1870	199	AA-9885	Bouey 1995	VALPAC
341	SAC-043, Brazil	Cultural	Surface deposit	N18/E19, Burial 34	Bone (human)	48	48	1900	150	1516	1843	2163	107	UCR-221	Bouey 1995	VALPAC
342	SAC-043, Brazil	Cultural	Surface deposit	N04/E17, Burial 68	Bone (human)	150	150	2170	55	2039	2185	2329	-235	AA-9886	Bouey 1995	VALPAC

Appendix A: Radiocarbon Database

Map No.	County, Area or Site	Context	Deposit	Provenience	Material	Min. Depth cm	Max. Depth cm	14C B.P.	+/-	Min. Cal BP	Cal B.P.	Max. Cal BP	AD/-BC	Lab. No.	Reference	Soil Series Name
343	SAC-043, Brazil	Cultural	Buried deposit	N58/E13, Burial 01	Bone (human)	102	102	2375	55	2318	2431	2546	-481	AA-9879	Bouey 1995	VALPAC
344	SAC-060, Hicks #1	Cultural	Surface deposit	Burial 38-11	Bone (human)	71	71	312	200	-5	332	563	1618	M-0749	Fredrickson 1974:43	DIERSSEN
345	SAC-060, Hicks #1	Cultural	Surface deposit	Burial 38-21	Bone (human)	163	163	1195	150	794	1112	1367	838	UCR-0219	Schulz 1981:242	DIERSSEN
346	SAC-060, Hicks #1	Cultural	Surface deposit	Burial 38-11	Bone (human)	122	122	1550	150	1222	1467	1817	483	UCR-0218	Schulz 1981:242	DIERSSEN
347	SAC-065, Dutard	Cultural	Surface deposit	Burial 03	Bone (human)	60	70	530	160	269	534	792	1416	UCR-0169	Schulz et al 1979:9	TINNIN
348	SAC-099, Deterding	Cultural	Surface deposit	Burial 99	Charcoal	132	132	770	150	508	729	974	1221	UCR-0225	Groza 2002	ORANGEVALE-KASEBERG
349	SAC-099, Deterding	Cultural	Surface deposit	?	Bone (human)	60	75	1050	150	722	975	1268	975	UCR-0224	Schulz 1981:242	ORANGEVALE-KASEBERG
350	SAC-099, Deterding	Cultural	Surface deposit	?	Bone (canis l.)	?	?	1430	125	1063	1344	1572	606	UCR-1563	Breschini et al. 1996; UCR 1986	ORANGEVALE-KASEBERG
351	SAC-099, Deterding	Cultural	Surface deposit	?	Bone (canis l.)	?	?	1890	170	1480	1833	2180	117	UCR-1564	Breschini et al. 1996; UCR 1986	ORANGEVALE-KASEBERG
352	SAC-107C, Windmiller	Cultural	Surface deposit	Burial 08	Bone (human)	132	132	2675	125	2427	2791	3077	-841	6X-0659	Ragir 1972	MADERA
353	SAC-107C, Windmiller	Cultural	Surface deposit	Burial 22	Bone (human)	107	107	3075	105	2961	3269	3483	-1319	I-02748	Ragir 1972	MADERA
354	SAC-133, Sloughhouse	Cultural	Surface deposit	Burial 05b, Unit S74/E19	Bone (human)	70	100	1130	90	908	1056	1277	894	Beta-50878	Bouey and Waechter 1992	KEYES
355	SAC-133, Sloughhouse	Cultural	Surface deposit	Burial 03, Unit S76/E19	Bone (human)	70	90	1210	90	961	1133	1291	817	Beta-50875	Bouey and Waechter 1992	KEYES
356	SAC-133, Sloughhouse	Cultural	Surface deposit	Burial 04, Unit S82.5/E10.5	Bone (human)	58	75	1270	80	1050	1191	1311	759	Beta-50876	Bouey and Waechter 1992	KEYES
357	SAC-133, Sloughhouse	Cultural	Surface deposit	Burial 02, Unit S82.5/E10.5	Bone (human)	40	60	1270	60	1064	1201	1294	749	Beta-50874	Bouey and Waechter 1992	KEYES
358	SAC-133, Sloughhouse	Cultural	Surface deposit	Burial 01, Unit S52/E25-26	Bone (human)	90	100	1280	70	1055	1203	1311	747	Beta-50873	Bouey and Waechter 1992	KEYES
359	SAC-133, Sloughhouse	Cultural	Surface deposit	Burial 0a, Unit S74/E19	Bone (human)	72	85	1440	100	1170	1354	1558	596	Beta-50877	Bouey and Waechter 1992	KEYES
360	SAC-145, Alkuhn/Stone Lake	Cultural	Surface deposit	Hearth	Charcoal	40	40	200	80	-4	192	356	1758	GAK-03898	Schulz 1981:243	DIERSSEN
361	SAC-145, Alkuhn/Stone Lake	Cultural	Surface deposit	Burial 11	Bone (human)	60	60	760	120	543	715	919	1235	GAK-03899	Schulz 1981:243	DIERSSEN
362	SAC-145, Alkuhn/Stone Lake	Cultural	Surface deposit	Burial 20	Bone (human)	150	150	980	100	686	886	1081	1064	GAK-03900	Schulz 1981:243	DIERSSEN
363	SAC-145, Alkuhn/Stone Lake	Cultural	Surface deposit	Burial 08	Bone (human)	90	108	1090	150	734	1016	1288	934	UCR-0192	Schulz 1981:243	DIERSSEN
364	SAC-145, Alkuhn/Stone Lake	Cultural	Surface deposit	Burial #?	Bone (human)	150	150	1355	160	931	1261	1568	689	UCR-0338	Schulz 1981:243	DIERSSEN
365	SAC-145, Alkuhn/Stone Lake	Cultural	Surface deposit	Burial #?	Bone (human)	150	150	1530	150	1172	1448	1815	502	UCR-0385	Schulz 1981:243	DIERSSEN
366	SAC-145, Alkuhn/Stone Lake	Cultural	Surface deposit	Burial 04	Bone (human)	80	90	2020	150	1690	1991	2341	-41	UCR-0193	Schulz 1981:243	DIERSSEN
367	SAC-145, Alkuhn/Stone Lake	Cultural	Surface deposit	Burial 19	Bone (human)	120	156	3300	150	3204	3547	3925	-1597	UCR-0139	Price 1982 (#149); Taylor 1975; Riddell ?	DIERSSEN
368	SAC-151, Need #1	Cultural	Surface deposit	Burial 19	Bone (human)	89	89	510	150	269	519	742	1431	UCR-0226	Schulz 1981:243	COLUMBIA
369	SAC-157, Wamser #1	Cultural	Surface deposit	Feature 2, 9S 2E	Charcoal	200	227	930	60	729	844	938	1106	Beta-138985	West. Hansen Welch, and Olsen 2001	AMERICANOS-URBAN
370	SAC-157, Wamser #1	Cultural	Surface deposit	NW Quad 9S 2E	Charcoal	110	120	930	50	740	846	929	1104	Beta-138984	West. Hansen Welch, and Olsen 2001	AMERICANOS-URBAN
371	SAC-157, Wamser #1	Cultural	Surface deposit	Feature 2, 9S 2E	Charcoal	170	180	1070	40	927	981	1058	969	Beta-138986	West. Hansen Welch, and Olsen 2001	AMERICANOS-URBAN
372	SAC-157, Wamser #1	Cultural	Surface deposit	NW Quad 19N 2W	Charcoal	90	100	2090	80	1888	2071	2210	-121	Beta-138987	West. Hansen Welch, and Olsen 2001	AMERICANOS-URBAN
373	SAC-168B	Cultural	Buried soil	Burial 17	Bone (human)	84	168	3070	170	2844	3252	3641	-1302	I-3037	Ragir 1972	COSUMNES
374	SAC-205, American River	Cultural	Buried deposit	Pieces from cut bank, some covered by 1.82 m of tailings	Charcoal	20	40	1410	40	1279	1320	1381	630	Beta-155042	West. Hansen Welch, and Olsen 2001	XERORTHENTS
375	SAC-267, Blodgett	Cultural	Surface deposit	Housepit 1	Charcoal	10	20	0	80	-6	132	155	1818	GAK-02772	Johnson 1976	SAN JOAQUIN
376	SAC-267, Blodgett	Cultural	Surface deposit	Strat. 1	Charcoal	70	75	0	175	-6	191	342	1759	GX-3376	Johnson 1976	SAN JOAQUIN
377	SAC-267, Blodgett	Cultural	Surface deposit	Feat 20	Charcoal	80	90	345	145	59	367	558	1583	GX-3378	Johnson 1976	SAN JOAQUIN
378	SAC-267, Blodgett	Cultural	Surface deposit	Burial 39	Bone (human)	90	103	610	120	429	601	789	1349	GX-3433	Johnson 1976	SAN JOAQUIN
379	SAC-267, Blodgett	Cultural	Surface deposit	Unit 48a, Midden	Charcoal	60	70	615	135	423	603	797	1347	GX-3380	Johnson 1976	SAN JOAQUIN
380	SAC-267, Blodgett	Cultural	Surface deposit	Hearth, 51c	Charcoal	30	40	710	150	475	677	956	1273	GX-3377	Johnson 1976	SAN JOAQUIN
381	SAC-267, Blodgett	Cultural	Surface deposit	Burial 06	Charcoal (bulbs)	98	98	830	120	623	774	966	1176	GAK-02445	Johnson 1976	SAN JOAQUIN
382	SAC-267, Blodgett	Cultural	Surface deposit	Burial 17	Charcoal (seeds)	96	96	870	80	677	796	927	1154	GAK-02444	Johnson 1976	SAN JOAQUIN
383	SAC-267, Blodgett	Cultural	Surface deposit	Unit 31B	Charcoal	40	50	880	60	694	802	918	1148	GAK-02443	Johnson 1976	SAN JOAQUIN
384	SAC-267, Blodgett	Cultural	Surface deposit	Burial 01	Charcoal	140	140	1370	90	1065	1285	1417	665	GAK-02442	Johnson 1976	SAN JOAQUIN
385	SAC-329, Walnut Grove	Cultural	Buried deposit	Buried by artificial fill, Unit 02, W	Charcoal (Black walnut)	210	220	350	150	59	369	561	1581	UCR-417	Soule 1976	LAUGENOUR
386	SAC-329, Walnut Grove	Cultural	Buried deposit	Buried by artificial fill, Unit 9W, Burial 1	Charcoal	240	240	625	150	422	610	803	1340	UCR-415	Soule 1976	LAUGENOUR
387	SAC-329, Walnut Grove	Cultural	Buried deposit	Buried by artificial fill, Unit 9W, Burial 1, one of two	Bone (human)	240	240	900	150	630	836	1096	1114	UCR-418	Soule 1976	LAUGENOUR
388	SAC-329, Walnut Grove	Cultural	Buried deposit	Buried by artificial fill, Unit 11E, sub-midden pit fill	Charcoal	170	180	1170	150	782	1091	1348	859	UCR-416	Soule 1976	LAUGENOUR
389	SIE, Sardine Valley	Natural	Buried deposit	Core from spring located east of Sardine Peak	Unknown	98	108	3490	40	3683	3765	3867	-1815	Beta-186716	Waechter & Andolina 2005	AQUOLLS AND BOROLLS
390	SIE, Sardine Valley	Natural	Buried deposit	Core from spring located east of Sardine Peak	Unknown	198	208	4300	40	4825	4864	4971	-2914	Beta-186717	Waechter & Andolina 2005	AQUOLLS AND BOROLLS
391	SIE, Sardine Valley	Natural	Buried deposit	Core from spring located east of Sardine Peak	Unknown	271	281	6180	40	6951	7080	7175	-5130	Beta-186718	Waechter & Andolina 2005	AQUOLLS AND BOROLLS
392	SIE, Sardine Valley	Natural	Buried deposit	Core from spring located east of Sardine Peak	Unknown	271	281	6380	40	7252	7315	7420	-5365	Beta-186719	Waechter & Andolina 2005	AQUOLLS AND BOROLLS
396	YOL, Davis	Natural	Buried soil	Putah Creek Fan, UC Davis campus (H225)	Soil (SOM)	200	200	3890	220	3705	4316	4857	-2366	GX-2127	Shlemon & Begg 1972	SYCAMORE
397	YOL, Davis	Natural	Buried soil	Putah Creek Fan, UC Davis campus	Soil (SOM)	200	200	4330	180	4424	4935	5329	-2985	GX-2128	Shlemon & Begg 1972	SYCAMORE
398	YOL, Davis	Natural	Buried soil	Putah Creek Fan, UC Davis campus	Soil (SOM)	400	400	9150	650	8695	10407	12240	-8457	GX-2129	Shlemon & Begg 1972	SYCAMORE
399	YOL, W. Sacramento	Natural	Buried deposit	From channel beneath natural levee; lateral accretion	Wood	850	850	2240	250	1692	2257	2845	-307	W-0436	Atwater 1982; Price 1982 (#499)	SACRAMENTO
400	YOL-013, Verona	Cultural	Surface deposit	Burial 03	Shell (*Olivella* bead C2)	?	?	1395	30	637	715	822	1235	CAMS-82179	Groza 2002	MERRITT

Appendix A: Radiocarbon Database

Map No.	County, Area or Site	Context	Deposit	Provenience	Material	Min. Depth cm	Max. Depth cm	14C B.P.	+/-	Min. Cal BP	Cal B.P.	Max. Cal BP	AD/-BC	Lab. No.	Reference	Soil Series Name
401	YOL-013, Verona	Cultural	Surface deposit	Burial 65	Charcoal	81	81	815	150	530	767	1002	1183	UCR-0146	Price 1982 (#156); Breschini et al. 1996	MERRITT
402	YOL-013, Verona	Cultural	Surface deposit	Burial 02	Shell (*Olivella* bead C3)	?	?	1475	35	687	795	902	1155	CAMS-82178	Groza 2002	MERRITT
403	YOL-013, Verona	Cultural	Surface deposit	Burial 14	Charcoal	37	37	865	150	544	808	1068	1142	UCR-0145	Price 1982 (#155); Breschini et al. 1996	MERRITT
404	YOL-013, Verona	Cultural	Surface deposit	Dog burial	Bone (human)	?	?	940	150	646	866	1178	1084	UCR-0195	Breschini et al. 1996	MERRITT
405	YOL-013, Verona	Cultural	Surface deposit	Burial 02	Shell (*Olivella* bead M1a)	?	?	1555	30	753	870	968	1080	CAMS-82177	Groza 2002	MERRITT
406	YOL-013, Verona	Cultural	Surface deposit	Burial 28	Bone (human)	61	61	1005	150	675	928	1185	1022	UCR-0196	Breschini et al. 1996	MERRITT
407	YOL-013, Verona	Cultural	Surface deposit	Burial 01 (Las Casitas)	Bone (human)	?	?	1125	140	768	1050	1298	900	UCR-1686D	Breschini et al. 1996	MERRITT
408	YOL-013, Verona	Cultural	Surface deposit	Burial 63	Bone (human)	104	104	1280	150	921	1186	1446	764	UCR-0197	Breschini et al. 1996	MERRITT
409	YOL-069	Cultural	Surface deposit	Burial 44	Charcoal	0	76	70	60	10	115	150	1835	Beta-177335	Wiberg 2005	SYCAMORE
410	YOL-069	Cultural	Surface deposit	Burial 09	Charcoal	38	46	90	50	10	116	150	1834	Beta-177329	Wiberg 2005	SYCAMORE
411	YOL-069	Cultural	Surface deposit	Burial 86	Charcoal	50	81	100		9	119	151	1831	Beta-177339	Wiberg 2005	SYCAMORE
412	YOL-069	Cultural	Surface deposit	EU-2, Feat. 2-2	Charcoal	0	80	130	50	4	135	152	1815	Beta-179715	Wiberg 2005	SYCAMORE
413	YOL-069	Cultural	Surface deposit	Burial 06	Shell (*Olivella* H1a)	89	96	750	40	41	153	262	1797	Beta-177327	Wiberg 2005	SYCAMORE
414	YOL-069	Cultural	Surface deposit	Burial 52	Charcoal	50	66	160	50	59	160	289	1790	Beta-177336	Wiberg 2005	SYCAMORE
415	YOL-069	Cultural	Surface deposit	Feature 10	Charcoal	89	89	160	40	60	167	233	1783	Beta-177326	Wiberg 2005	SYCAMORE
416	YOL-069	Cultural	Surface deposit	Burial 18	Charcoal	38	63	180	50	60	173	233	1777	Beta-177333	Wiberg 2005	SYCAMORE
417	YOL-069	Cultural	Surface deposit	Feature 18	Charcoal	47	47	190	50	60	177	233	1773	Beta-179718	Wiberg 2005	SYCAMORE
418	YOL-069	Cultural	Surface deposit	Feature 9	Charcoal	76	84	200	60	54	184	319	1766	Beta-177325	Wiberg 2005	SYCAMORE
419	YOL-069	Cultural	Surface deposit	Burial 03	Shell (*Olivella* H2)	39	52	790	40	49	191	300	1759	Beta-179712	Wiberg 2005	SYCAMORE
420	YOL-069	Cultural	Surface deposit	Burial 84	Shell (*Olivella* H1b)	67	78	800	40	50	201	313	1749	Beta-177337	Wiberg 2005	SYCAMORE
421	YOL-069	Cultural	Surface deposit	Burial 16	Shell (marine)	38	56	810	40	52	212	333	1738	Beta-177331	Wiberg 2005	SYCAMORE
422	YOL-069	Cultural	Surface deposit	Burial 06	Shell (*Olivella* A1b)	89	96	870	40	142	294	420	1656	Beta-177328	Wiberg 2005	SYCAMORE
423	YOL-069	Cultural	Surface deposit	Burial 16	Shell (marine)	38	56	880	40	177	307	431	1643	Beta-177332	Wiberg 2005	SYCAMORE
424	YOL-069	Cultural	Surface deposit	Burial 84	Shell (*Olivella* A1b)	67	78	880	40	177	307	431	1643	Beta-177338	Wiberg 2005	SYCAMORE
425	YOL-069	Cultural	Surface deposit	Burial 94	Shell (*Olivella* M4)	101	115	880	40	177	307	431	1643	Beta-179713	Wiberg 2005	SYCAMORE
426	YOL-069	Cultural	Surface deposit	Burial 16	Plant remain (textile)	38	56	260	40	269	309	459	1641	Beta-177330	Wiberg 2005	SYCAMORE
427	YOL-069	Cultural	Surface deposit	Burial 94	Shell (*Olivella* M4)	101	115	900	40	227	330	459	1620	Beta-179714	Wiberg 2005	SYCAMORE
428	YOL-069	Cultural	Surface deposit	Feature 6	Charcoal	25	32	310	60	282	384	502	1566	Beta-179717	Wiberg 2005	SYCAMORE
429	YOL-069	Cultural	Surface deposit	EU-5, Feat. 5-1	Charcoal	30	50	320	50	296	390	495	1560	Beta-179716	Wiberg 2005	SYCAMORE
430	YOL-069	Cultural	Surface deposit	Feature 25	Charcoal	56	71	380	60	309	424	512	1526	Beta-179719	Wiberg 2005	SYCAMORE
431	YOL-069	Cultural	Surface deposit	Burial 34	Charcoal	36	56	400	50	421	449	521	1501	Beta-177334	Wiberg 2005	SYCAMORE
432	YOL-110	Cultural	Surface deposit	Burial 11	Shell (*Olivella* bead G5)	?	?	2640	30	1909	2050	2188	-100	CAMS-82180	Groza 2002	TEHAMA
433	YOL-182	Cultural	Surface deposit	Burial 04	Charcoal (wood)	40	60	220	60	59	204	333	1746	Beta-74702	BioSystems 1995	SYCAMORE
434	YOL-182	Cultural	Surface deposit	Burial 04	Plant remain (cordage)	40	60	310	50	288	386	493	1564	Beta-74700	BioSystems 1995	SYCAMORE
435	YOL-182	Cultural	Surface deposit	Burial 04	Bone (human)	40	60	360	60	305	406	507	1544	Beta-74699	BioSystems 1995	SYCAMORE
436	YOL-182	Cultural	Surface deposit	Burial 04	Shell (clam disk bead)	40	60	1290	60	514	745	630	1205	Beta-74701	BioSystems 1995	SYCAMORE
437	YOL-187	Cultural	Surface deposit	House Floor	Charcoal	?	?	160	60	56	159	295	1791	Beta-137626	Wohlgemuth n.d.	YOLO
438	YOL-187	Cultural	Surface deposit	Burial 02, cremation	Charcoal	68	100	360	60	305	406	507	1544	?	Wohlgemuth n.d.	YOLO
439	YOL-187	Cultural	Surface deposit	Burial 02	Shell (*Olivella* M2a)	68	85	1160	30	475	539	625	1411	CAMS-79703	Groza 2002	YOLO
440	YOL-187	Cultural	Surface deposit	Burial 02	Shell (*Olivella* M2a)	85	100	1200	80	438	570	701	1380	CAMS-79486	Groza 2002	YOLO
441	YOL-197	Cultural	Surface deposit	CU 2	Shell (*Olivella* bead E1)	30	40	750	40	41	153	262	1797	Beta-191546	Milliken 2004	REIFF
442	YOL-197	Cultural	Surface deposit	Trench 1, CU 15, Feature 2, articulated pig	Bone (pig)	40	50	160	50	59	174	289	1776	Beta-172507	Milliken 2004	REIFF
443	YOL-197	Cultural	Surface deposit	CU 7	Shell (*Olivella* bead E2a)	30	40	840	40	107	257	407	1693	Beta-191548	Milliken 2004	REIFF
444	YOL-197	Cultural	Surface deposit	CU 2	Bone (mammal)	10	20	240	40	143	285	331	1665	Beta-172503	Milliken 2004	REIFF
445	YOL-197	Cultural	Surface deposit	CU 2	Bone (elk)	50	60	250	70	252	295	489	1655	Beta-172504	Milliken 2004	REIFF
446	YOL-197	Cultural	Surface deposit	CU 3a	Bone (mammal)	20	30	260	40	269	309	459	1641	Beta-172505	Milliken 2004	REIFF
447	YOL-197	Cultural	Surface deposit	CU 7	Shell (*Olivella* bead A1c)	10	20	990	30	301	404	486	1546	Beta-191547	Milliken 2004	REIFF
448	YOL-197	Cultural	Surface deposit	CU 9a	Bone (mammal)	50	70	360	70	292	405	518	1545	Beta-172506	Milliken 2004	REIFF
449	YOL-197	Cultural	Surface deposit	CU 2	Shell (*Olivella* bead E3a)	10	20	1000	30	306	414	491	1536	Beta-191545	Milliken 2004	REIFF
450	YUB, Best Slough	Natural	Buried soil	Beale AFB, Parks Lake, Trench 13	Charcoal	180	200	760	70	628	703	799	1247	Beta-112109	Eidsness and Meyer 1999	CONEJO
451	YUB, Best Slough	Natural	Buried soil	Beale AFB, Parks Lake, Trench 25	Soil (SOM)	190	205	2480	50	2428	2563	2721	-613	Beta-112108	Eidsness and Meyer 1999	CONEJO
452	YUB, Best Slough	Natural	Buried soil	Beale AFB, Parks Lake, Trench 13	Soil (SOM)	190	210	3110	80	3077	3320	3480	-1370	Beta-112107	Eidsness and Meyer 1999	CONEJO
453	YUB, Honcut Creek	Natural	Buried deposit	South bank of creek	Wood	?	?	610	80	510	601	683	1349	UM-2149	Price 1982 (#240); from D. Marchand	TRAINER
454	YUB, Honcut Creek	Natural	Surface deposit	South bank of southernmost channel, 3C1 horizon	Wood	120	120	625	60	534	603	673	1347	Beta-001650	Busacca 1982	TRAINER
455	YUB, Honcut Creek	Natural	Surface deposit	East bank of N-S reach, 6 m south of old fenceline	Charcoal	96	96	1110	95	900	1037	1265	913	Beta-001652	Busacca 1982	CONEJO

Appendix A: Radiocarbon Database

Map No.	County, Area or Site	Context	Deposit	Provenience	Material	Min. Depth cm	Max. Depth cm	14C B.P.	+/-	Min. Cal BP	Cal B.P.	Max. Cal BP	AD/-BC	Lab. No.	Reference	Soil Series Name
456	YUB, Honcut Creek	Natural	Surface deposit	SE corner of Section 14, east bank of creek?	Charcoal	47	47	1775	110	1479	1696	1929	254	Beta-001655	Busacca 1982	TRAINER
457	YUB-1157, Best Slough	Cultural	Surface deposit	Beale AFB, Control Unit 1	Bone (mammal)	70	80	1440	50	1277	1340	1415	610	Beta-123447	Eidsness and Meyer 1999	CONEJO
458	YUB-1157, Best Slough	Natural	Buried channel	Beale AFB, Trench 7-22-5	Wood (willow)	300	300	1890	30	1733	1839	1894	111	QA-300	Eidsness and Meyer 1999	CONEJO
459	YUB-1157, Best Slough	Natural	Buried deposit	Beale AFB, Trench 7-23-4	Charcoal	145	155	2530	90	2356	2585	2764	-635	Beta-124445	Eidsness and Meyer 1999	CONEJO
460	YUB-1157, Best Slough	Natural	Buried soil	Beale AFB, Trench 7-23-4	Soil (SOM)	170	190	2790	50	2769	2893	3005	-943	Beta-123444	Eidsness and Meyer 1999	CONEJO
461	COL, Salt Canyon	Natural	Buried soil	Northeast bank, 3Ab, below Corval (A/Cu) and Capay (2Ab)	Soil (SOM)	310	325	5380	35	6173	6200	6282	-4250	OS-62873	Meyer and Rosenthal 2008 (in progress)	CORVAL
462	COL, Salt Creek, Arbuckle	Natural	Buried soil	South creek bank, 2ABtb, below Westfan	Soil (SOM)	150	160	2090	35	1986	2062	2150	-112	OS-62979	Meyer and Rosenthal 2008 (in progress)	WESTFAN
463	COL, Upper Freshwater Site	Cultural	Buried soil	Northeast bank, under slab, base of Westfan, 6.9 Napa flake	Charcoal	195	195	3580	40	3818	3883	3983	-1933	Beta-233071	Meyer and Rosenthal 2008 (in progress)	WESTFAN
464	GLE, "Elk Hoe" Site	Natural	Surface deposit	West bank Sac, Orland deep phase Cu, below surface site	Charcoal	200	200	205	35	138	181	223	1769	OS-63003	Meyer and Rosenthal 2008 (in progress)	ORLAND
465	GLE, Nye Creek	Natural	Buried soil	South creek bank, 3Ab, below Zamora	Soil (SOM)	130	140	3160	40	3325	3389	3465	-1439	Beta-233073	Meyer and Rosenthal 2008 (in progress)	ZAMORA
466	GLE, Orbend Bridge	Natural	Buried soil	West bank of Sac. Riv., 2ABtb, below Wyo	Soil (SOM)	140	145	3420	30	3580	3670	3726	-1720	OS-63002	Meyer and Rosenthal 2008 (in progress)	WYO
467	GLE-105, Near Orbend-B	Natural	Buried soil	West bank of Sac., 3ABtb below Tehama series	Soil (SOM)	130	150	11080	60	12892	12999	13106	-11049	Beta-233072	Meyer and Rosenthal 2008 (in progress)	TEHAMA
468	GLE-105, Near Orbend-C	Cultural	Buried soil	West bank Sac. Riv., hearth feature, lower 2Ab of Tehama	Charcoal	70	76	2500	40	2454	2582	2739	-632	OS-63002	Meyer and Rosenthal 2008 (in progress)	TEHAMA
469	GLE-105, Near Orbend-D	Natural	Buried soil	West bank of Sac. Riv., 2Ab below Wyo	Soil (SOM)	140	150	2320	30	2306	2342	2363	-392	OS-63100	Meyer and Rosenthal 2008 (in progress)	WYO
470	SAC, Laguna Creek	Natural	Buried soil	South bank, burn zone, Cu horizon, base of Hicksville	Soil (SOM)	270	280	5410	40	6176	6230	6296	-4280	OS-62983	Meyer and Rosenthal 2008 (in progress)	SAILBOAT
471	SAC-026, Discovery Park	Natural	Buried soil	East bank of Sac. River, 4Ab, below Columbia	Soil (SOM)	550	580	3680	40	3897	4020	4096	-2070	Beta-233074	Meyer and Rosenthal 2008 (in progress)	COLUMBIA
472	SAC-026, Discovery Park	Natural	Buried soil	East bank of Sac. River, 3Ab, below Columbia	Soil (SOM)	380	400	2750	40	2765	2841	2929	-891	Beta-233075	Meyer and Rosenthal 2008 (in progress)	COLUMBIA
473	YOL, Chickahominy Site	Cultural	Buried soil	South/east bank, hearth feature on top of 2Ab	Charcoal	110	120	745	25	664	682	724	1268	OS-63004	Meyer and Rosenthal 2008 (in progress)	BRENTWOOD
474	YOL, Chickahominy Slough	Natural	Buried deposit	Profile 3, 2Cu (pea gravel), base of Tehama terrace	Charcoal	800	810	10250	70	11745	12000	12244	-10050	OS-62975	Meyer and Rosenthal 2008 (in progress)	TEHAMA
475	YOL, Chickahominy Slough	Natural	Buried soil	South/east bank, Profile 2, 3Ab with burn zone at top	Soil (SOM)	300	310	9400	50	10507	10631	10747	-8681	OS-63029	Meyer and Rosenthal 2008 (in progress)	TEHAMA

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Analytical Procedures

Final Report

The final report package includes the final date report, a statement outlining our analytical procedures, a glossary of pretreatment terms, calendar calibration information, billing documents (containing balance/credit information and the number of samples submitted within the yearly discount period), and peripheral items to use with future submittals. The final report includes the individual analysis method, the delivery basis, the material type and the individual pretreatments applied. The final report has been sent by mail and e-mail (where available).

Pretreatment

Pretreatment methods are reported along with each result. All necessary chemical and mechanical pretreatments of the submitted material were applied at the laboratory to isolate the carbon, which may best represent the time event of interest. When interpreting the results, it is important to consider the pretreatments. Some samples cannot be fully pretreated, making their ^{14}C ages more subjective than samples, which can be fully pretreated. Some materials receive no pretreatments. Please look at the pretreatment indicated for each sample and read the pretreatment glossary to understand the implications.

Analysis

Materials measured by the radiometric technique were analyzed by synthesizing sample carbon to benzene (92% C), measuring for ^{14}C content in one of 53 scintillation spectrometers, and then calculating for radiocarbon age. If the Extended Counting Service was used, the ^{14}C content was measured for a greatly extended period of time. AMS results were derived from reduction of sample carbon to graphite (100 %C), along with standards and backgrounds. The graphite was then detected for ^{14}C content in one of 9 accelerator-mass-spectrometers (AMS).

The Radiocarbon Age and Calendar Calibration

The "Conventional ^{14}C Age (*)" is the result after applying $^{13}C/^{12}C$ corrections to the measured age and is the most appropriate radiocarbon age. If an "*" is attached to this date, it means the $^{13}C/^{12}C$ was estimated rather than measured (The ratio is an option for radiometric analysis, but included on all AMS analyses.) Ages are reported with the units “BP” (Before Present). “Present” is defined as AD 1950 for the purposes of radiocarbon dating.

Results for samples containing more ^{14}C than the modern reference standard are reported as “percent modern carbon” (pMC). These results indicate the material was respiring carbon after the advent of thermo-nuclear weapons testing (an is less than ~ 50 years old).

Applicable calendar calibrations are included for materials between about 100 and 19,000 BP. If calibrations are not included with a report, those results were either too young, too old, or inappropriate for calibration. Please read the enclosed page discussing calibration.

PRETREATMENT GLOSSARY
Standard Pretreatment Protocols at Beta Analytic

Unless otherwise requested by a submitter or discussed in a final date report, the following procedures apply to pretreatment of samples submitted for analysis. This glossary defines the pretreatment methods applied to each result listed on the date report form (e.g. you will see the designation “acid/alkali/acid” listed along with the result for a charcoal sample receiving such pretreatment).

Pretreatment of submitted materials is required to eliminate secondary carbon components. These components, if not eliminated, could result in a radiocarbon date, which is too young or too old. Pretreatment does not ensure that the radiocarbon date will represent the time event of interest. This is determined by the sample integrity. Effects such as the old wood effect, burned intrusive roots, bioturbation, secondary deposition, secondary biogenic activity incorporating recent carbon (bacteria) and the analysis of multiple components of differing age are just some examples of potential problems. The pretreatment philosophy is to reduce the sample to a single component, where possible, to minimize the added subjectivity associated with these types of problems. If you suspect your sample requires special pretreatment considerations be sure to tell the laboratory prior to analysis.

"acid/alkali/acid"

The sample was first gently crushed/dispersed in deionized water. It was then given hot HCI acid washes to eliminate carbonates and alkali washes (NaOH) to remove secondary organic acids. The alkali washes were followed by a final acid rinse to neutralize the solution prior to drying. Chemical concentrations, temperatures, exposure times, and number of repetitions, were applied accordingly with the uniqueness of the sample. Each chemical solution was neutralized prior to application of the next. During these serial rinses, mechanical contaminants such as associated sediments and rootlets were eliminated. This type of pretreatment is considered a "full pretreatment". On occasion the report will list the pretreatment as "acid/alkali/acid - insolubles" to specify which fraction of the sample was analyzed. This is done on occasion with sediments (See "acid/alkali/acid - solubles"

Typically applied to: charcoal, wood, some peats, some sediments, and textiles "acid/alkali/acid - solubles"

On occasion the alkali soluble fraction will be analyzed. This is a special case where soil conditions imply
That the soluble fraction will provide a more accurate date. It is also used on some occasions to verify the present/absence or degree of contamination present from secondary organic acids. The sample was first pretreated with acid to remove any carbonates and to weaken organic bonds. After the alkali washes (as discussed above) are used, the solution containing the alkali soluble fraction is isolated/filtered and combined with acid. The soluble fraction, which precipitates, is rinsed and dried prior to combustion.

"acid/alkali/acid/cellulose extraction"

Following full acid/alkali/acid pretreatments, the sample is bathed in (sodium chlorite) $NaClO_2$ under very controlled conditions (Ph = 3, temperature = 70 degrees C). This eliminates all components except wood cellulose. It is useful for woods that are either very old or highly contaminated.

Applied to: wood

"acid washes"

Surface area was increased as much a possible. Solid chunks were crushed, fibrous materials were shredded, and sediments were dispersed. Acid (HCI) was applied repeatedly to ensure the absence of carbonates. Chemical concentrations, temperatures, exposure times, and number of repetitions, were applied accordingly with the uniqueness of each sample. The sample was not be subjected to alkali washes to ensure the absence of secondary organic acids for intentional reasons. The most common reason is that the primary carbon is soluble in the alkali. Dating results reflect the total organic content of the analyzed material. Their accuracy depends on the researcher's ability to subjectively eliminate potential contaminants based on contextual facts.

Typically applied to: organic sediments, some peats, small wood or charcoal, special cases

PRETREATMENT GLOSSARY
Standard Pretreatment Protocols at Beta Analytic
(Continued)

"collagen extraction: with alkali" or "collagen extraction: without alkali"

The material was first tested for friability ("softness"). Very soft bone material is an indication of the potential absence of the collagen fraction (basal bone protein acting as a "reinforcing agent" within the crystalline apatite structure). It was then washed in de-ionized water, the surface scraped free of the outer most layers and then gently crushed. Dilute, cold HCI acid was repeatedly applied and replenished until the mineral fraction (bone apatite) was eliminated. The collagen was then dissected and inspected for rootlets. Any rootlets present were also removed when replenishing the acid solutions. "With alkali" refers to additional pretreatment with sodium hydroxide (NaOH) to ensure the absence of secondary organic acids. "Without alkali" refers to the NaOH step being skipped due to poor preservation conditions, which could result in removal of all available organics if performed.

Typically applied to: bones

"acid etch"

The calcareous material was first washed in de-ionized water, removing associated organic sediments and debris (where present). The material was then crushed/dispersed and repeatedly subjected to HCI etches to eliminate secondary carbonate components. In the case of thick shells, the surfaces were physically abraded prior to etching down to a hard, primary core remained. In the case of porous carbonate nodules and caliches, very long exposure times were applied to allow infiltration of the acid. Acid exposure times, concentrations, and number of repetitions, were applied accordingly with the uniqueness of the sample.

Typically applied to: shells, caliches, and calcareous nodules

"neutralized"

Carbonates precipitated from ground water are usually submitted in an alkaline condition (ammonium Hydroxide or sodium hydroxide solution). Typically this solution is neutralized in the original sample container, using deionized water. If larger volume dilution was required, the precipitate and solution were transferred to a sealed separatory flask and rinsed to neutrality. Exposure to atmosphere was minimal.

Typically applied to: Strontium carbonate, Barium carbonate
(i.e. precipitated ground water samples)

"carbonate precipitation"

Dissolved carbon dioxide and carbonate species are precipitated from submitted water by complexing them as ammonium carbonate. Strontium chloride is added to the ammonium carbonate solution and strontium carbonate is precipitated for the analysis. The result is representative of the dissolved inorganic carbon within the water. Results are reported as "water DIC".

Applied to: water

"solvent extraction"

The sample was subjected to a series of solvent baths typically consisting of benzene, toluene, hexane, pentane, and/or acetone. This is usually performed prior to acid/alkali/acid pretreatments.

Applied to: textiles, prevalent or suspected cases of pitch/tar contamination, conserved materials.

"none"

No laboratory pretreatments were applied. Special requests and pre-laboratory pretreatment usually accounts for this.

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Calendar Calibration at Beta Analytic

Calibrations of radiocarbon age determinations are applied to convert BP results to calendar years. The short-term difference between the two is caused by fluctuations in the heliomagnetic modulation of the galactic cosmic radiation and, recently, large scale burning of fossil fuels and nuclear devices testing. Geomagnetic variations are the probable cause of longer-term differences.

The parameters used for the corrections have been obtained through precise analyses of hundreds of samples taken from known-age tree rings of oak, sequoia, and fir up to about 10,000 BP. Calibration using tree-rings to about 12,000 BP is still being researched and provides somewhat less precise correlation. Beyond that, up to about 20,000 BP, correlation using a modeled curve determined from U/Th measurements on corals is used. This data is still highly subjective. Calibrations are provided up to about 19,000 years BP using the most recent calibration data available.

The Pretoria Calibration Procedure (Radiocarbon, Vol 35, No.1, 1993, pg 317) program has been chosen for these calendar calibrations. It uses splines through the tree-ring data as calibration curves, which eliminates a large part of the statistical scatter of the actual data points. The spline calibration allows adjustment of the average curve by a quantified closeness-of-fit parameter to the measured data points. A single spline is used for the precise correlation data available back to 9900 BP for terrestrial samples and about 6900 BP for marine samples. Beyond that, splines are taken on the error limits of the correlation curve to account for the lack of precision in the data points.

In describing our calibration curves, the solid bars represent one sigma statistics (68% probability) and the hollow bars represent two sigma statistics (95% probability). Marine carbonate samples that have been corrected for $^{13}C/^{12}C$, have also been corrected for both global and local geographic reservoir effects (as published in Radiocarbon, Volume 35, Number 1, 1993) prior to the calibration. Marine carbonates that have not been corrected for $^{13}C/^{12}C$ are adjusted by an assumed value of 0 %0 in addition to the reservoir corrections. Reservoir corrections for fresh water carbonates are usually unknown and are generally not accounted for in those calibrations. In the absence of measured $^{13}C/^{12}C$ ratios, a typical value of -5 %0 is assumed for freshwater carbonates.

(Caveat: the correlation curve for organic materials assume that the material dated was living for exactly ten years (e.g. a collection of 10 individual tree rings taken from the outer portion of a tree that was cut down to produce the sample in the feature dated). For other materials, the maximum and minimum calibrated age ranges given by the computer program are uncertain. The possibility of an "old wood effect" must also be considered, as well as the potential inclusion of younger or older material in matrix samples. Since these factors are indeterminant error in most cases, these calendar calibration results should be used only for illustrative purposes. In the case of carbonates, reservoir correction is theoretical and the local variations are real, highly variable and dependent on provenience. Since imprecision in the correlation data beyond 10,000 years is high, calibrations in this range are likely to change in the future with refinement in the correlation curve. The age ranges and especially the intercept ages generated by the program must be considered as approximations.)

EXPLANATION OF THE BETA ANALYTIC DENDRO-CALIBRATION PRINTOUT

CALIBRATION OF RADICARBON AGE TO CALENDAR YEARS

Variables used in the calculation of age calibration → **(Variables: C13/C12= :Delta-R= :Glob res= :lab. multi=1)**

Laboratory Number: **Beta-12345**

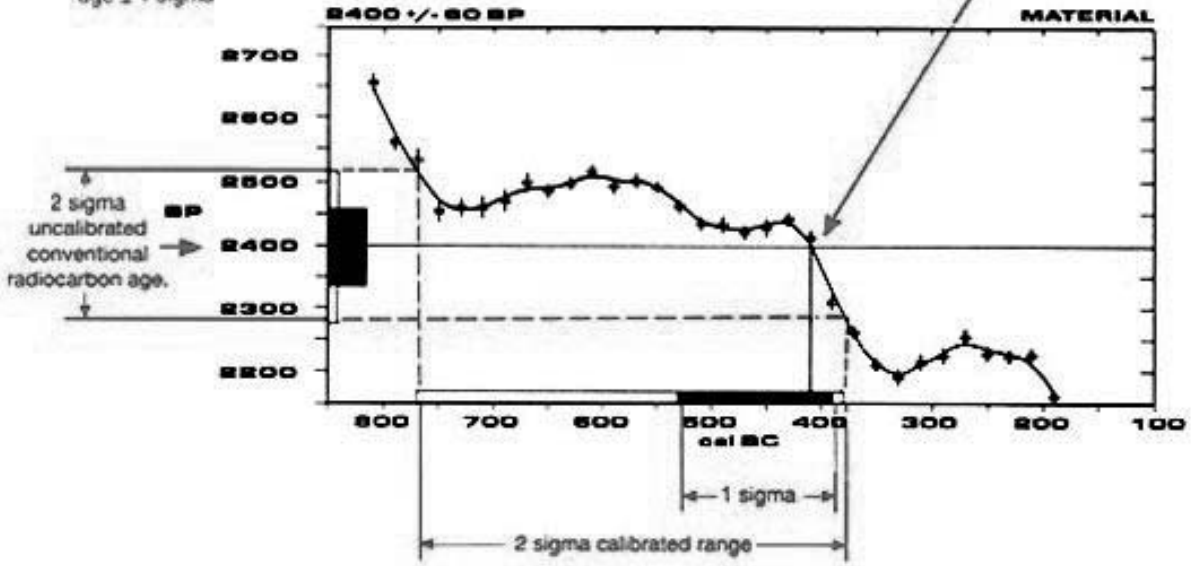
Conventional radiocarbon age: **2400 +/- 60 BP** ← The uncalibrated conventional radiocarbon age (± 1 sigma)

The recommended calibration age range to be used for interpretation → **Calibrated result: (2 sigma, 95% probability)** **cal BC 770 to 380**

Intercept data:

Intercept of conventional radiocarbon age with calibration curve: **cal BC 410** ← The intercept between the conventional radiocarbon age and the calibrated calendar time scale curve.

The calibration result of the conventional radiocarbon age ± 1 sigma → 1 sigma calibrated result: (68% probability) **cal BC 530 to 390**



References:

Pretoria Calibration Curve for Short Lived Samples
Vogel, J.C., Fuls, A., Visser, E. and Becker, B., 1993, Radiocarbon 35(1), p73-86

A Simplified Approach to Calibrating C14 Dates
Talma, A.S. and Vogel, J.C., 1993, Radiocarbon 35(2), p317-322

Calibration - 1993
Stuiver, M., Long, A., Kra, R.S. and Devine, J.M., 1993, Radiocarbon 35(1)

Beta Analytic, Inc., 4985 S.W. 74th Court, Miami, Florida 33155

Reporting results (recommended):

1. List the conventional radiocarbon age with its associated 1 sigma standard deviation in a table and designate it as such.
2. Discussion of ages in the text should focus on the 2 sigma calibrated range.

FROM: Darden Hood, Director (mailto:mailto:dhood@radiocarbon.com)
(This is a copy of the letter being mailed. Invoices/receipts follow only by mail.)

August 20, 2007

Dr. William Hildebrandt/Liz Honeysett
Far Western Anthropological Research
Group, Incorporated
2727 Del Rio Place
Suite A
Davis, CA 95618

RE: Radiocarbon Dating Results For Samples COLUSA-195BS, GLE105-3ABtb, NYE-CR-3Ab, SAC26-STRI, SAC26-STRII

Dear Dr. Hildebrandt:

Enclosed are the radiocarbon dating results for five samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Our invoice is enclosed. Please, forward it to the appropriate officer or send VISA charge authorization. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

Dr. William Hildebrandt/Liz Honeysett

Report Date: 8/20/2007

Far Western Anthropological Research Group, Incorporated

Material Received: 7/27/2007

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 233071	3580 +/- 40 BP	-25.2 o/oo	3580 +/- 40 BP
SAMPLE : COLUSA-195BS			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 2030 to 1870 (Cal BP 3980 to 3820) AND Cal BC 1840 to 1820 (Cal BP 3790 to 3770) Cal BC 1790 to 1780 (Cal BP 3740 to 3730)			
Beta - 233072	11080 +/- 60 BP	-24.8 o/oo	11080 +/- 60 BP
SAMPLE : GLE105-3ABtb			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 11180 to 10930 (Cal BP 13130 to 12880)			
Beta - 233073	3160 +/- 40 BP	-24.7 o/oo	3160 +/- 40 BP
SAMPLE : NYE-CR-3Ab			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 1500 to 1380 (Cal BP 3450 to 3330)			
Beta - 233074	3680 +/- 40 BP	-24.8 o/oo	3680 +/- 40 BP
SAMPLE : SAC26-STRI			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 2190 to 2170 (Cal BP 4140 to 4120) AND Cal BC 2150 to 1950 (Cal BP 4100 to 3900)			
Beta - 233075	2750 +/- 40 BP	-24.9 o/oo	2750 +/- 40 BP
SAMPLE : SAC26-STRII			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 1000 to 810 (Cal BP 2940 to 2760)			

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.2:lab. mult=1)

Laboratory number: **Beta-233071**

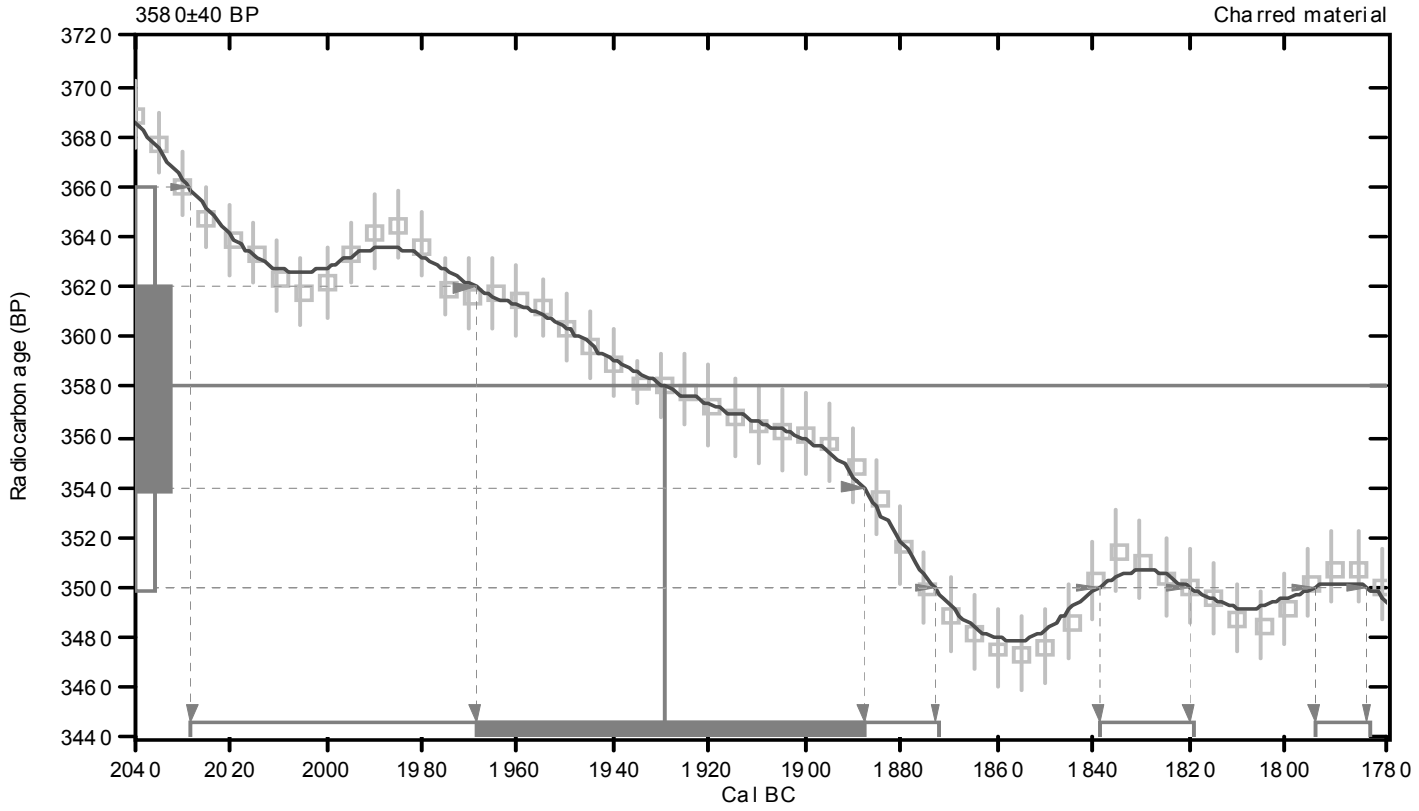
Conventional radiocarbon age: **3580±40 BP**

2 Sigma calibrated results: **Cal BC 2030 to 1870 (Cal BP 3980 to 3820) and**
(95% probability) **Cal BC 1840 to 1820 (Cal BP 3790 to 3770) and**
Cal BC 1790 to 1780 (Cal BP 3740 to 3730)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 1930 (Cal BP 3880)

1 Sigma calibrated result: Cal BC 1970 to 1890 (Cal BP 3920 to 3840)
(68% probability)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.8:lab. mult=1)

Laboratory number: **233072**

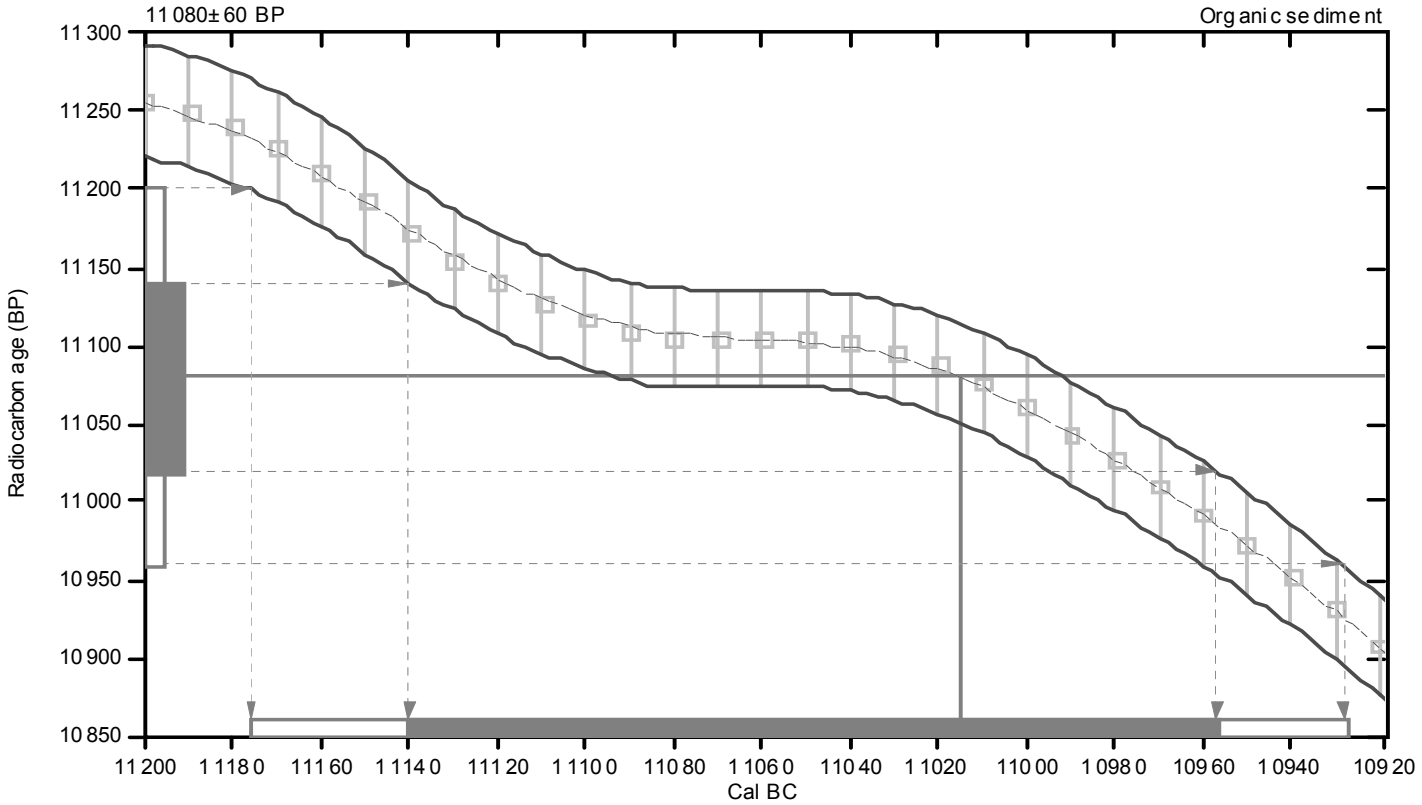
Conventional radiocarbon age: **11080±60 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 11180 to 10930 (Cal BP 13130 to 12880)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 11020 (Cal BP 12960)

1 Sigma calibrated result: (68% probability) Cal BC 11140 to 10960 (Cal BP 13090 to 12910)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.7:lab. mult=1)

Laboratory number: **233073**

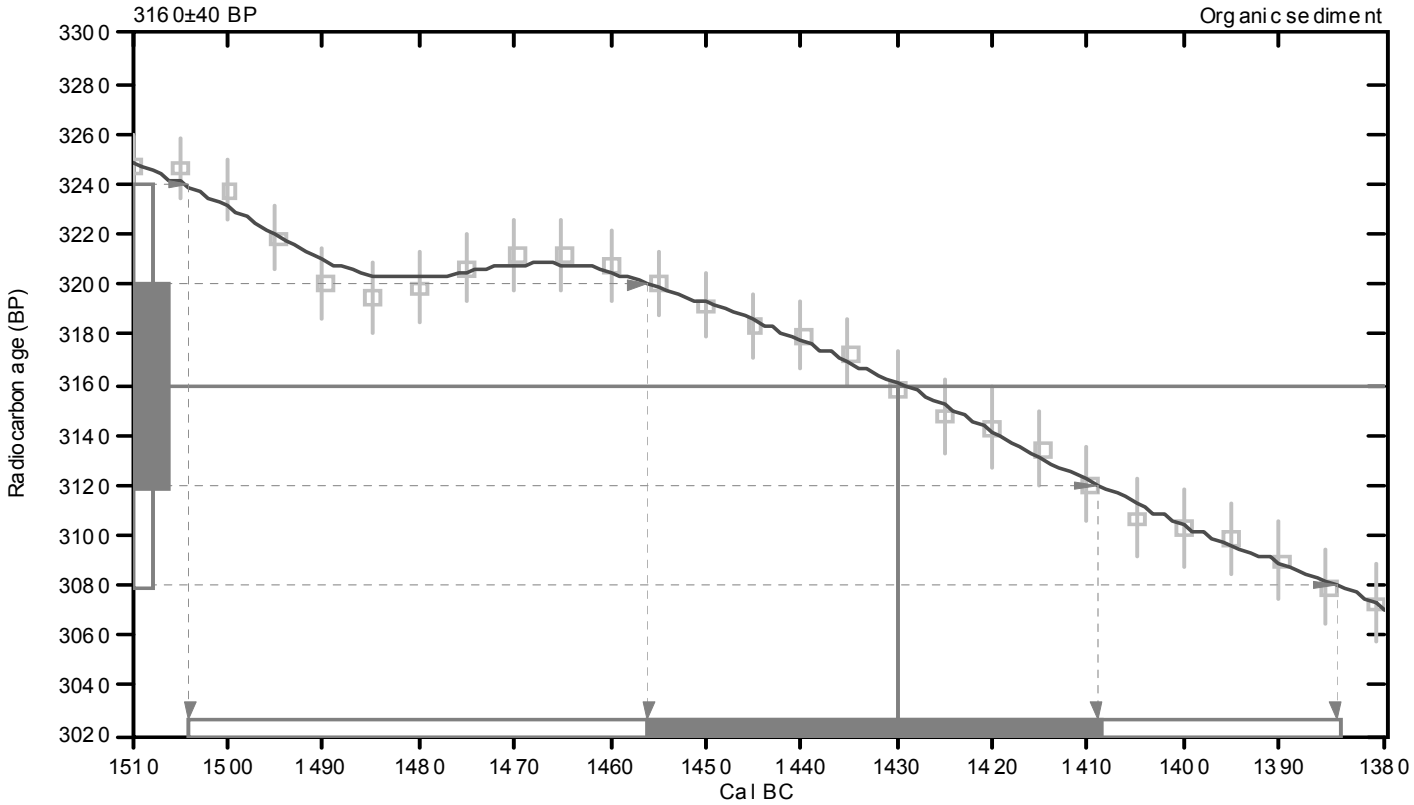
Conventional radiocarbon age: **3160±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 1500 to 1380 (Cal BP 3450 to 3330)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 1430 (Cal BP 3380)

1 Sigma calibrated result: (68% probability) Cal BC 1460 to 1410 (Cal BP 3410 to 3360)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.8:lab. mult=1)

Laboratory number: **233074**

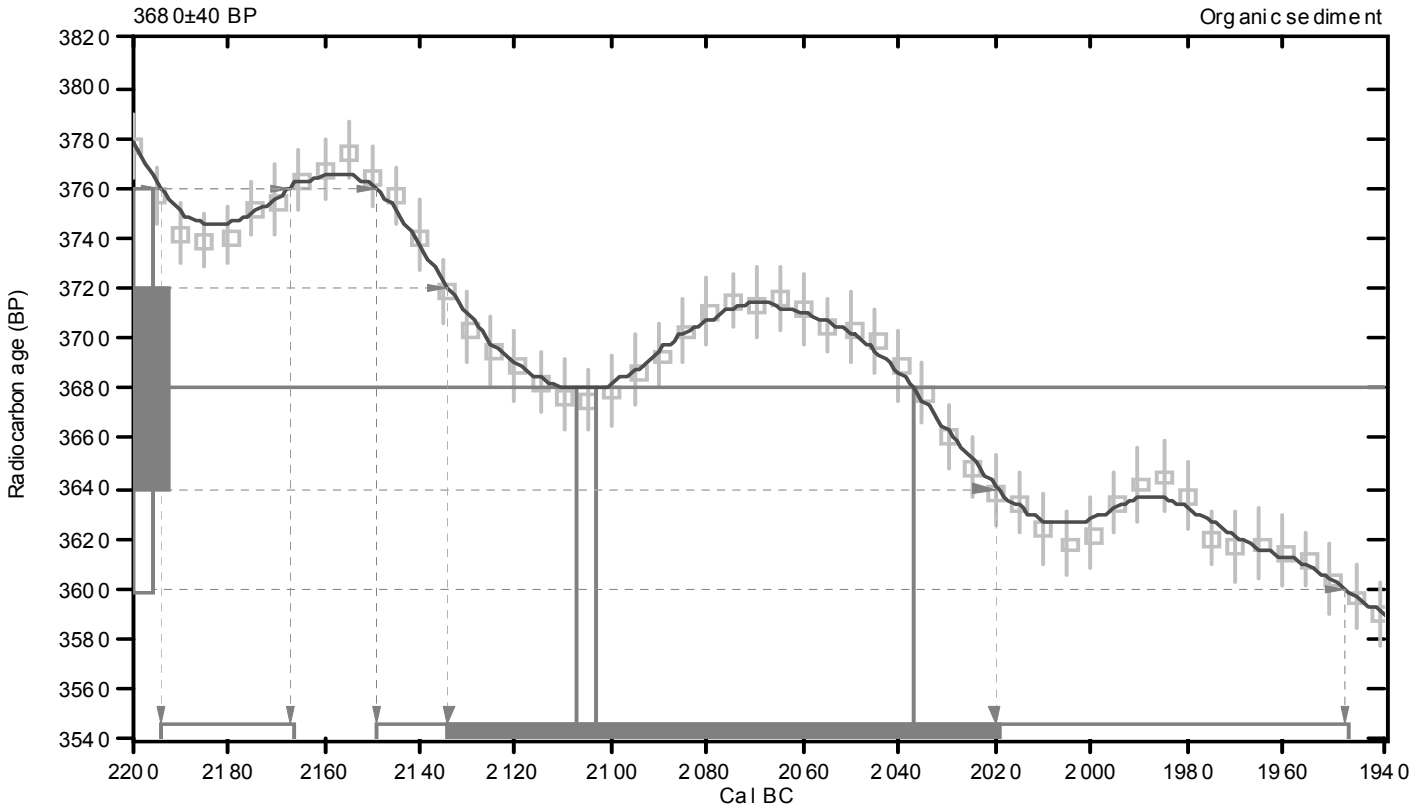
Conventional radiocarbon age: **3680±40 BP**

2 Sigma calibrated results: **Cal BC 2190 to 2170 (Cal BP 4140 to 4120) and**
(95% probability) **Cal BC 2150 to 1950 (Cal BP 4100 to 3900)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal BC 2110 (Cal BP 4060) and
Cal BC 2100 (Cal BP 4050) and
Cal BC 2040 (Cal BP 3990)

1 Sigma calibrated result: Cal BC 2130 to 2020 (Cal BP 4080 to 3970)
(68% probability)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.9:lab. mult=1)

Laboratory number: **233075**

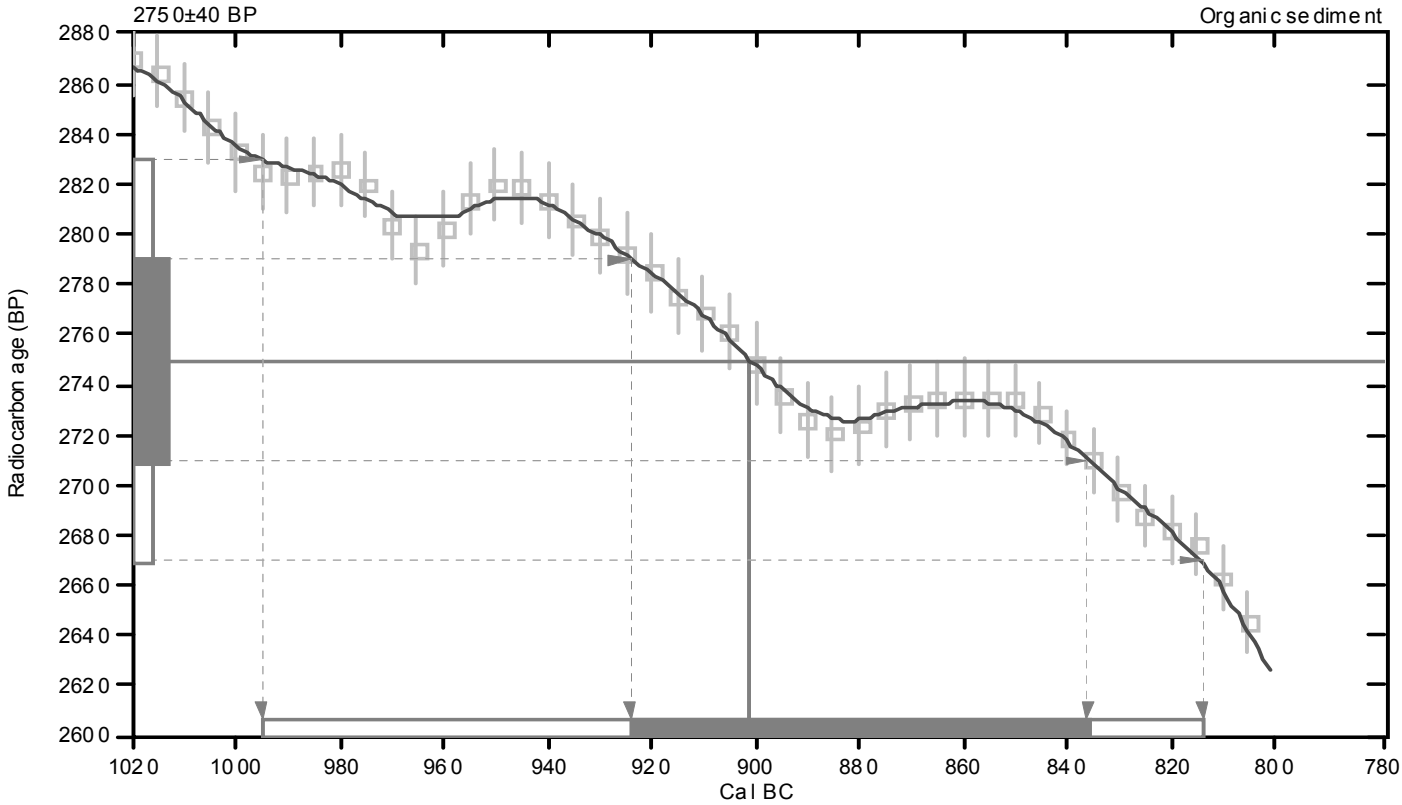
Conventional radiocarbon age: **2750±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 1000 to 810 (Cal BP 2940 to 2760)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 900 (Cal BP 2850)

1 Sigma calibrated result: (68% probability) Cal BC 920 to 840 (Cal BP 2870 to 2790)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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General Statement of ^{14}C Procedures
at the National Ocean Sciences AMS Facility

All laboratory preparations for AMS radiocarbon analyses of submitted samples occur in the NOSAMS Sample Preparation Lab unless otherwise noted on the attached report of Final Results. Procedures appropriate to the raw material being analyzed include: acid hydrolysis (HY), combustion (OC), or stripping of CO_2 gas from water (WS) samples. Carbon dioxide, whether submitted directly (GS) or generated at the NOSAMS Facility, is reacted with catalyst to form graphite. An Fe/H_2 catalytic-reduction is used for all except very small samples, where a Co/H_2 catalytic-reduction is used. Graphite is pressed into targets, which are analyzed on the accelerator along with standards and process blanks. Two primary standards are used during all ^{14}C measurements: NBS Oxalic Acid I (NIST-SRM-4990) and Oxalic Acid II (NIST-SRM-4990C). The ^{14}C activity ratio of Oxalic Acid II ($\delta^{13}C$ = -17.3 per mil) to Oxalic Acid I ($\delta^{13}C$ = -19.0 per mil) is taken to be 1.293. Every group of samples processed includes an appropriate blank, which is analyzed concurrently with the group. Process blank materials include IAEA C-1 Carrara marble for inorganic carbon and gas samples; a Johnson-Mathey 99.9999% graphite powder for organic carbon samples; and a commercial tank of ^{14}C- free CO_2 for seawater samples.

Fraction Modern (F_m) is a measurement of the deviation of the $^{14}C/C$ ratio of a sample from "modern." Modern is defined as 95% of the radiocarbon concentration (in AD 1950) of NBS Oxalic Acid I normalized to $\delta^{13}C_{VPDB}$ = -19 per mil (Olsson, 1970). AMS results are calculated using the internationally accepted modern value of $1.176 \pm 0.010 \times 10^{-12}$ (Karlen, *et. al*., 1968) and a final ^{13}C-correction is made to normalize the sample F_m to a $\delta^{13}C_{VPDB}$ value of -25 per mil.

Stable isotope measurements of sample $\delta^{13}C$ used to correct F_m values are typically made at the NOSAMS Facility by analyzing sub-samples of the CO_2 gas generated during graphite production with either a VG PRISM or VG OPTIMA mass spectrometer. However, some carbonate samples are reacted and measured directly with the VG PRISM ISOCARB. The $\delta^{13}C$ value used to calculate the F_m of a sample is specified in the report of Final Results.

Reporting of ages and/or activities follows the convention outlined by Stuiver and Polach (1977) and Stuiver (1980). Radiocarbon ages are calculated using 5568 (yrs) as the half-life of radiocarbon and are reported without reservoir corrections or calibration to calendar years. A $\Delta^{14}C$ activity normalized to 1950 is also reported according to these conventions. The activity, or $\Delta^{14}C$ of the sample is further corrected to account for the decay between collection (or death) and the time of

measurement if a collection date is specified on the submittal form, otherwise $\Delta^{14}C$ is reported assuming that collection and measurement date are the same.

Atoms of ^{14}C contained in a sample are directly counted using the AMS method of radiocarbon analysis, therefore, internal statistical errors are calculated using the number of counts measured from each target. An external error is calculated from the reproducibility of individual analyses for a given target. The error reported is the larger of the internal or external errors.

When reporting AMS results of samples run at the NOSAMS facility, accession numbers (e.g. OS-####'s) are required to be listed together with the results. To avoid confusion, we suggest tabulating OS-numbers and associated radiocarbon ages as they appear on the attached Final Report in addition to any subsequent corrections that may need to be made to the ages. We ask that published results acknowledge support from NSF by including the NSF Cooperative Agreement number, OCE-9807266. The NOSAMS facility would appreciate receiving reprints or preprints of papers referencing AMS analyses made at the NOSAMS facility.

Any sample material not consumed during sample preparation or AMS radiocarbon analysis is archived for two years at the NOSAMS Facility unless other arrangements are made by the submitter.

REFERENCES

Karlen, I., Olsson, I.U., Kallburg, P. and Kilici, S., 1968. Absolute determination of the activity of two ^{14}C dating standards. Arkiv Geofysik, 4:465-471.

Olsson, I.U., 1970. The use of Oxalic acid as a Standard. *In* I.U. Olsson, ed., Radiocarbon Variations and Absolute Chronology, Nobel Symposium, 12th Proc., John Wiley & Sons, New York, p. 17.

Stuiver, M. and Polach, H.A., 1977. Discussion: Reporting of ^{14}C data. Radiocarbon, 19:355-363.

Stuiver, M., 1980. Workshop on ^{14}C data reporting. Radiocarbon, 22:964-966.

NOSAMS
National Ocean Sciences Accelerator Mass Spectrometry Facility

Radiocarbon Results

Kind	Type	Submitter Identification	Description	Process	NOSAMS Accession #	d13C	d13C Source	F Modern	Fm Error	Age	Age Error	D14C	DIC
Organic	Charcoal	Yolo County, California YOL-Chick3-800	2Cu base of Tehama	OC	OS-62975	-25.11	N MEASURED	0.278673	0.0024	10250	70	-723.2	0
Organic	Sediment	Yolo County, California YOL-Chick2-300	3Ab horizon	OC	OS-63029	-26.45	N MEASURED	0.310197	0.0019	9400	50	-691.9	0
Organic	Charcoal	Yolo County, California YOL-Chick2-FT110	2Ab - hearth feature	OC	OS-63004	-24.03	N MEASURED	0.911590	0.0031	745	25	-94.7	0
Organic	Sediment	Sacramento County, California SAC-Laguna-270	2Ab below Hicksville	OC	OS-62983	-25.31	N MEASURED	0.510073	0.0026	5410	40	-493.4	0
Organic	Charcoal	Glenn County, California GLE-Orland-200	Cu base of Orland	OC	OS-63003	-26.74	N MEASURED	0.974975	0.0041	205	35	-31.7	0
Organic	Sediment	Glenn County, California GLE-Ordbend-140	2ABtb below Wyo	OC	OS-63002	-25.31	N MEASURED	0.653376	0.0023	3420	30	-351.1	0
Organic	Sediment	Glenn County, California GLE-105-140	2Ab below Wyo	OC	OS-63100	-25.94	N MEASURED	0.748913	0.0030	2320	30	-256.2	0
Organic	Charcoal	Glenn County, California GLE-105-FT70	2Ab upper Tehama	OC	OS-62876	-24.42	N MEASURED	0.732889	0.0035	2500	40	-272.1	0
Organic	Sediment	Colusa County, California COL-SaltCK-150	2Ab below Westfan	OC	OS-62979	-25.48	N MEASURED	0.770347	0.0033	2090	35	-234.9	0
Organic	Sediment	Colusa County, California COL-Salt-310	3Ab below Capay	OC	OS-62873	-25.03	N MEASURED	0.512088	0.0023	5380	35	-491.4	0

APPENDIX B

MAP UNITS AND ASSOCIATED SOIL SERIES IN CALTRANS DISTRICT 3

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
ACIDIC ROCK LAND	2										2
AHART-ROCK OUTCROP	6										6
AHART-WACA	18										18
AHWAHNEE	33										33
AHWAHNEE-ROCK	8										8
AIKEN	92										92
AIKEN-COHASSET	6										6
AIKEN-HORSESHOE	3										3
ALAMO		3									3
ALAMO-FIDDYMENT		5									5
ALCAPAY						5					5
ALDAX-MILLICH	16										16
ALDAX-ROCK OUTCROP	3										3
ALDI VARIANT-KYBURZ	6										6
ALDI VARIANT-MARTIS		3									3
ALDI-AQUOLLS	3										3
ALDI-KYBURZ	2										2
ALDI-KYBURZ-ROCK OUTCROP	6										6
ALLUVIAL LAND								6			6
ALMENDRA						7					7
ALTAMONT	30										30
ALTAMONT	12										12
ALTAMONT AND MILLSHOLM	5										5
ALTAMONT-CONTRA COSTA	9										9
ALTAMONT-DIBBLE	8										8
ALTAMONT-GULLIED	16										16
ALTAMONT-NACIMIENTO	4										4
ALTAMONT-ROCKY	5										5
ALTAMONT-SEHORN	18										18
ALTAMONT-SHEDD	4										4
AMADOR-GILLENDER	7										7
AMERICANOS-URBAN			5								5
ANDIC CRYUMBREPTS	2										2
ANDREGG	45										45
ANDREGG-ROCK OUTCROP	6										6
ANDREGG-SHENANDOAH	6										6
ANDREGG-URBAN	19										19
ANITA			6								6
ANITA-GALT			9								9
AQUEPTS AND UMBREPTS						2					2
AQUOLLS						1					1
AQUOLLS AND BOROLLS						2					2
ARAND							9				9
ARAND-RIVERWASH								5			5
ARBUCKLE			49								49
ARBUCKLE-HILLGATE			6								6
AREAS EXCAVATED									1		1
AREAS UNDER WATER										1	1
ARGONAUT	23										23
ARGONAUT-AUBURN	27										27
ARGONAUT-AUBURN-URBAN	5										5
ARGONAUT-ROCK OUTCROP	6										6
ARGOVAR	3										3
ARTOIS		12									12
AUBERRY	34										34
AUBERRY-ROCK OUTRCROP	9										9
AUBURN	64										64
AUBURN-ARGONAUT	10										10
AUBURN-ARGONAUT-ROCK	27										27
AUBURN-SOBRANTE	87										87
AUBURN-SOBRANTE-ROCK	49										49
AUBURN-TIMBUCTOO-ARGONAUT	12										12
AYAR	18										18
AYAR -NACIMIENTO	4										4

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
BABCOCK	24										24
BABCOCK-ROCK	8										8
BADENAUGH			11								11
BADENAUGH-MARTINECK-DOTTA		3									3
BALCOM	17										17
BALCOM-AYAR	15										15
BALCOM-DIBBLE	3										3
BALMAN					9						9
BALMAN-RAMELLI							3				3
BAMTUSH-MARPA	12										12
BASIC ROCK LAND	2										2
BEACHES								13			13
BEARVALLEY						4					4
BECKWOURTH-LOYALTON					4						4
BEECEE	5										5
BEECEE-LYDON	7										7
BELLAVISTA			9								9
BIDART						7					7
BIDWELL					12						12
BIEBER							13				13
BIGHILL-MUSICK	2										2
BIGHILL-ROCK OUTCROP	3										3
BIGRIDGE-MINNIECREEK	28										28
BILLSCABIN-BONNEYRIDGE	16										16
BLAVO						6					6
BOAR-SLEEPER	10										10
BOGA-LOEMSTONE			16								16
BONEPILE	10										10
BONEPILE TAXADJUNCT	4										4
BONNEYRIDGE	11										11
BONNEYRIDGE-CHAWANAKEE	37										37
BONNEYRIDGE-LEWISFLAT	25										25
BOOMER	14										14
BOOMER	74										74
BOOMER-PENDOLA	14										14
BOOMER-ROCK OUTCROP	33										33
BOSQUEJO						23					23
BOTTLEHILL-LOGTRAIN	6										6
BOTTLEHILL-WALKERMINE	19										19
BRENTWOOD						5					5
BRESSA-DIBBLE	4										4
BRUELLA		12									12
BUCKING FAMILY							3				3
BUCKING-BUCKING	12										12
BUMLAKE-ROADCAT			9								9
BURRIS		9									9
BUSACCA						4					4
BUTTES-MILLSHOLM	5										5
BYINGTON							5				5
CAGWIN ROCK OUTCROP	48										48
CALCIC HAPLOXEROLLS						4					4
CALLAT			12								12
CALPINE		11									11
CALPINE-LOVEJOY		8									8
CAMELIAN-UMPA	8										8
CAPAY						98					98
CAPERTON	5										5
CAPERTON-ANDREGG	12										12
CAPERTON-ROCK OUTCROP	10										10
CARHART TAXADJUNCT		5									5
CARHART-ANITA TAXADJUNCT		5									5
CASSENAI	60										60
CASTRO						18					18
CELIO						5					5

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
CELIO VARIANT-ROCK OUTCROP	5										5
CELIO-GEFO-AQUOLLS						3					3
CERPONE-TYPIC	13										13
CHAIX	53										53
CHAIX VARIANT-ROCK OUTCROP	6										6
CHAIX-CHAWANAKEE	9										9
CHAIX-HOLLAND	8										8
CHAIX-HOTAW	15										15
CHAIX-HURLBUT	4										4
CHAIX-PILLIKEN	4										4
CHAIX-ROCK OUTCROP	8										8
CHAIX-WAPI	21										21
CHARGER							7				7
CHAWANAKEE	5										5
CHAWANAKEE-BILLSCABIN	5										5
CHAWANAKEE-CHAIX-HOTAW	10										10
CHEROKEESPRING	6										6
CHEROTABLE-KRAMN	6										6
CHICO			5								5
CHINACAMP	29										29
CHRISTOPHER			15								15
CHRISTOPHER-GEFO				6							6
CINDER LAND-SIERRAVILLE	3										3
CLALLAM	13										13
CLALLAM - ROCK OUTCROP	9										9
CLALLAM-HOLLAND	10										10
CLEAR LAKE							92				92
CLEARHAYES-HAMSLOUGH			9								9
CLIMARA	3		2								5
COALCANYON TAXADJUNCT	19		3								22
COALCANYON-COONHOLLOW	13		16								29
COALCANYON-ROCK OUTCROP	7		15								22
COALCANYON-TALUS	4										4
CODORA						4					4
COHASSET	115										115
COHASSET-AIKEN-CROZIER	9										9
COHASSET-HARTLESS	2										2
COHASSET-MCCARTHY	26										26
COLLUVIAL LAND	7										7
COLUMBIA								135			135
COLUMBIA-URBAN								11			11
COLUSA					5						5
COMETA		8									8
COMETA-FIDDYMENT		6									6
COMETA-RAMONA		6									6
CONEJO						27					27
CONEJO-TISDALE						6					6
CONEJO-URBAN						10					10
CONTRA COSTA	16										16
CONTRA COSTA-ALTAMONT	6										6
CONTRA-COSTA-MILLSHOLM	7										7
COOLBRITH						8					8
CORBETT	4										4
CORBIERE						12					12
CORIDGE-ROCK OUTCROP	8										8
CORNING		25									25
CORNING-GULLIED		3									3
CORNING-NEWVILLE		7									7
CORNING-REDDING		10									10
CORRECO			23								23
CORTINA							21				21
CORVAL							8				8
COSUMNES								22			22
COSUMNES-URBAN								7			7

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
COYOTECREEK						5					5
CREVISCREEK			6								6
CROZIER	4										4
CROZIER-COHASSET	12										12
CROZIER-MARIPOSA	3										3
CROZIER-MCCARTHY	13										13
CRYSTALHILL-OREGONGULCH	35										35
CRYUMBREPTS							1				1
CRYUMBREPTS ASSOCIATION			2								2
CUT AND FILL									1		1
DAGGET	54										54
DAGGET-ROCK OUTCROP	8										8
DAM									7		7
DEADWOOD-CLALLAM	20										20
DEADWOOD-KISTIRN	5										5
DEADWOOD-ROCK OUTCROP	8										8
DEJONAH-STAGPOINT	15										15
DELLEKER		11									11
DELLEKER-KYBURZ	3										3
DELPIEDRA	3										3
DIABLO	1										1
DIAMOND SPRINGS	22										22
DIBBLE	9										9
DIBBLE-MILLSHOLM	14										14
DIERSSEN		20									20
DIXMINE-MAC	11										11
DIXMINE-SPINE	11										11
DIXMINE-TOADTOWN	29										29
DODGELAND (frequent)								6			6
DODGELAND (occasional)						6					6
DOEMILL-JOKERST	20										20
DOME			1								1
DOME			1								1
DOME-ZEIBRIGHT			4								4
DOTTA		26									26
DUBAKELLA	26										26
DUBAKELLA ROCK OUTCROP	5										5
DUMPS									6		6
DUNSTONE-ARGONAUT	8										8
DUNSTONE-LOAFERCREEK	53										53
DUNSTONE-LOMARICA	9										9
DURIC XERARENTS									13		13
DURIC XERARENTS-EASTBIGGS									6		6
DURIC XERARENTS-OROVILLE									4		4
DURIXERALFS		5									5
DURIXERALFS-GALT		7									7
DURIXERALFS-TYPIC		7									7
DURIXEROLLS-HAPLOXEROLLS						16					16
DYSTRIC LITHIC XEROCHREPTS	5										5
DYSTROXEREPTS-HAPLOXERALFS	8										8
EASTBIGGS		7									7
EASTBIGGS-GALT		6									6
EASTPARK		9									9
EDJOBE						4					4
EGBERT							18				18
EGBERT-URBAN								6			6
ELLISPEAK-ROCK OUTCROP	18										18
ELLISPEAK-WACA	15										15
ELSEY-BEATSONHOLLOW	8										8
ENDOAQUOLLS						8					8
ERODED LAND, ALLUVIAL		2									2
ERODED LAND, SHALE	3										3
ESQUON						18					18
ESQUON-CLEARLAKE						5					5

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
ESQUON-NEERDOBE						7					7
ETSEL-MAYMEN-MARPA	9										9
EUER-AQUOLLS		3									3
EUER-MARTIS		4									4
EXCHEQUER	4										4
EXCHEQUER-ROCK OUTCROP	6										6
EXETER		4									4
FARWELL						18					18
FEATHER								3			3
FEATHERFALLS-ISLANDBAR	28										28
FIDDYMENT		21									21
FIDDYMENT-KASEBERG		4									4
FIDDYMENT-ORANGEVALE		7									7
FIDDYMENT-ORANGEVALE-URBAN		6									6
FIDDYMENT-URBAN		6									6
FLAGCANYON TAXADJUNCT		8									8
FLAGCANYON-WICKSCORNER		7									7
FLANLY	34										34
FLANLY-OROSE-VERJELES	12										12
FLANLY-ROCK OUTCROP	6										6
FLANLY-SOMMEYFLAT	8										8
FLANLY-SWEDESFLAT	6										6
FLANLY-SWEDESFLAT-RACKERBY	8										8
FLORAND-LOSTRIDGE	9										9
FLUVAQUENTIC HUMAQUEPTS	3										3
FLUVAQUENTS								10	3		13
FLUVENTS								1			1
FOPIANO-WACA	5										5
FORBES-DUBAKELLA	6										6
FORBES-HOLLAND	3										3
FOUNTS-YORKVILLE	6										6
FRANKTOWN-ALDI-ROCK OUTCROP	6										6
FREELPEAK-WINDYRIDGE	8										8
FREEZEOUT-YOLLABOLLY	10										10
FUGAWEE SANDY LOAM	4										4
FUGAWEE VARIANT-AQUOLLS	3										3
FUGAWEE VARIANT-FUGAWEE	2										2
FUGAWEE-JORGE	3										3
FUGAWEE-POLECREEK	5										5
FUGAWEE-ROCK OUTCROP	3										3
FUGAWEE-ROCK OUTCROP-TAHOMA	15										15
FUGAWEE-TAHOMA	7										7
GALEPPI			11								11
GALT						40					40
GALT-URBAN						6					6
GARRETSON								4			4
GAZWELL								6			6
GEFO						12					12
GEFO-AQUOLLS-CELIO						3					3
GERLE			1								1
GERLE-NANNY			4								4
GERLE-NOTNED			2								2
GERLE-TALLAC			4								4
GERLE-UMBREPTS			2								2
GIANELLA							32				32
GIBSONVILLE-WACA	12										12
GLEAN	8										8
GOLDEAGLE-POSITAS	9										9
GOODLOW-DRIVERS	4										4
GOODLOW-HAPLAQUOLLS						6					6
GOULDING	8										8
GOVSTANFORD								10			10
GRANDBEND							10				10
GRANTIC ROCK LAND	7										7

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
GRAVEL PITS									4		4
GRAVELLY ALLUVIAL LANDS							4		1		5
GRIDLEY			44								44
GRIFFGULCH-SURNUF	16										16
GRIFFGULCH-SURNUF-SPINE	16										16
GULLIED LAND	1										1
HADSELVILLE-PENTZ	11										11
HANGTOWN-LITHIC XERUMBREPTS	2										2
HANGTOWN-SMOKEY	4										4
HAPLIC PALEXERALFS		4									4
HAPLOXERALFS		6									6
HAPLOXERANDS			28								28
HAPLOXERANDS-AQUIC							6				6
HAPLOXERERTS	5										5
HAPLOXEROLLS						14					14
HARTLESS	3										3
HARTLESS-MIERUF	6										6
HARTLESS-NEUNS	4										4
HARTSMILL-MOUNTHOPE	24										24
HAYPRESS	3										3
HAYPRESS-BONTA	4										4
HAYPRESS-BUCKING	8										8
HAYPRESS-SATTLEY	4										4
HAYPRESS-TOIYABE	33										33
HAYPRESS-TOIYABE ROCK OUTCROP	4										4
HAYPRESS-TOIYABE-ROCK OUTCROP	3										3
HEDGE			8								8
HELLHOLE PEAT						4					4
HENNEKE	7										7
HENNEKE-MONTARA ROCK OUTCROP	15										15
HENNEKE-OKIOTA	12										12
HENNEKE-ROCK OUTCROP	4										4
HICKSVILLE					24						24
HIETANEN-MAC	25										25
HILLGATE		65									65
HILLGATE-GULLIED		10									10
HODA	22										22
HODA-MUSICK	13										13
HODA-ROCK OUTCROP	4										4
HOHMANN	8										8
HOLILLIPAH								37			37
HOLLAND	93										93
HOLLAND-BIGHIL	4										4
HOLLAND-CHAIX	4										4
HOLLAND-HODA	35										35
HOLLAND-MUSICK	4										4
HOLLAND-PILLIKEN	4										4
HOLLAND-SKALAN	2										2
HOLLAND-WAPI	10										10
HOLLENBECK						13					13
HOLLENBECK-URBAN						5					5
HORSESHOE	45										45
HORSESHOE-AIKEN	4										4
HORSESHOE-JOCAL	3										3
HORSESHOE-RUBBLE	5										5
HORST						8					8
HOTAW	19										19
HOTAW-CHAWANAKEE	14										14
HUGO	12										12
HULLS	12										12
HULRBUT	20										20
HULRBUT-CHAIX	8										8
HURLBUT-DEADWOOD	18										18
HURLBUT-HOLLAND	4										4

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
HUSTABEL						5					5
HUYSINK-HORSESHOE		4									4
IGNORD						5					5
INKS	10										10
INKS-EXCHEQUER	6										6
INVILLE-MARTIS			2								2
INVILLE-RIVERWASH			3								3
INVILLE-WOODSEYE	8										8
IRON MOUNTAIN	13										13
IRON MOUNTAIN- ROCK OUTCROP	8										8
ISLANDBAR-CHAWANAKEE	24										24
JABU		10									10
JACINTO					8						8
JACKTONE					10						10
JAMES CANYON						10					10
JOBSIS-WHITTELL-ROCK OUTCROP	10										10
JOCAL	62										62
JOCAL-HARTLESS	4										4
JOCAL-MARIPOSA	3										3
JOKERST-DOEMILL	10										10
JORGE	43										43
JORGE-CRYUMBREPTS	5										5
JORGE-RUBBLE	4										4
JORGE-TAHOMA	41										41
JORGE-WACA	12										12
JOSEPHINE	115										115
JOSEPHINE-MARIPOSA	36										36
JOSEPHINE-MAYMEN	4										4
JOSEPHINE-ROCK OUTCROP	19										19
JOSEPHINE-SHEETIRON	3										3
KASEBERG-FIDDYMENT	7										7
KEYES		5									5
KILAGA		20									20
KIMBALL		37									37
KIMBALL-GULLIED		3									3
KIMBALL-URBAN		6									6
KINGSBEACH			5								5
KINKEL VARIANT-COHASSET	8										8
KISTIRN-AIKEN	4										4
KNEERIDGE			20								20
KUSALSLOUGH							5				5
KYBURZ	1										1
KYBURZ-ALDI	14										14
KYBURZ-ROCK OUTCROP	9										9
KYBURZ-TROJAN	14										14
LANDLOW			6								6
LANG							21				21
LANG-URBAN							4				4
LAUGENOUR							16				16
LAUGENOUR -URBAN							5				5
LAVA FLOW-LAVATOP	8										8
LAVA FLOW-LUMPKIN	16										16
LEDFORD	1										1
LEDFORD-LEDFORD	10										10
LEDFORD-NOTNED	4										4
LEDFORD-ROCK OUTCROP	2										2
LEDMOUNT-MCCARTHY-ROCK OUTCROP	6										6
LEDMOUNT-ROCK OUTCROP	4										4
LEESVILLE						10					10
LEWISFLAT	21										21
LITHIC CRYUMBREPTS	5										5
LITHIC XERORTHENTS	9										9
LITHNIP-MEISS	20										20
LIVEOAK						33					33

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
LIVEOAK-GALT						16					16
LIVEOAK-URBAN						6					6
LIVERMORE						4					4
LLANOSECO						10					10
LOAMY ALLUVIAL LAND								7			7
LODO-GULLIED	8										8
LODO-MILLSAP	8										8
LODO-TEHAMA	14										14
LOFGREN-BLAVO						10					10
LOGTRAIN-BOTTLEHILL	7										7
LORACK		1									1
LORACK-SMOKEY		6									6
LOS GATOS	15										15
LOS GATOS-JOSEPHINE	5										5
LOS GATOS-PARRISH	4										4
LOVEJOY			10								10
LOYALTON					10						10
LUCKSEV-BUTTESIDE	17										17
LUMBERLY	2										2
LUMPKIN-ROCK OUTCROP	15										15
LYDON	12										12
LYDON-ROCK OUTCROP	18										18
MADE LAND									4		4
MADERA		10									10
MADERA-GALT		6									6
MALLARD			25								25
MARCUM			13								13
MARCUM-GRIDLEY			18								18
MARIA						10					10
MARIPOSA	62										62
MARIPOSA-JOCAL	15										15
MARIPOSA-JOSEPHINE	31										31
MARIPOSA-MAYMEN	9										9
MARIPOSA-ROCK OUTCROP	39										39
MARLA							6				6
MARTINECK		8									8
MARTIS-EUER		2									2
MARVIN					29						29
MARYSVILLE		3									3
MATERSON	12										12
MAYMEN	15										15
MAYMEN-ETSEL	22										22
MAYMEN-HOPLAND	31										31
MAYMEN-LOS GATOS	8										8
MAYMEN-MARIPOSA	7										7
MAYMEN-MILLSHOLM	3										3
MAYMEN-PARRISH	8										8
MAYMEN-ROCK OUTCROP	21										21
MAYWOOD							9				9
MCCARTHY	57										57
MCCARTHY-LEDMOUNT	24										24
MCQUARRIE-DUCO	8										8
MEDISAPRISTS								3			3
MEEKS			108								108
MEISS-GULLIED LAND	3										3
MEISS-ROCK OUTCROP	6										6
MEISS-WACA	13										13
MELODY-ROCK OUTCROP	32										32
MERRITT							19				19
METAMORPHIC	1										1
MIERUF	2										2
MILDRED	20										20
MILLERIDGE-BOXROBBER	30										30
MILLSAP	6										6

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
MILLSHOLM	96										96
MILLSHOLM-ALTAMONT	12										12
MILLSHOLM-CAPAY	6										6
MILLSHOLM-CONTRA COSTA	20										20
MILLSHOLM-GULLIED	4										4
MILLSHOLM-LODO	5										5
MILLSHOLM-ROCK OUTCROP	11										11
MILLSHOLM-SALTCANYON			7								7
MIXED ALLUVIAL LAND						1		3			4
MODA		3									3
MODA TAXADJUNCT-ARBUCKLE		5									5
MOKELUMNE	9										9
MOKELUMNE-PITS									7		7
MONTARA	4										4
MOONBEND						15					15
MOTTSVILLE-QUINCY					4						4
MOUNTHOPE-HARTSMILL	15										15
MOUNTYANA	10										10
MUDWASH	5										5
MUDWASH-TIMBERISLAND	9										9
MUNJAR-TUSCAN		8									8
MUSICK	32										32
MUSICK-ROCK OUTCROP	5										5
MYERS			26								26
MYERS-GULLIED			5								5
NACIMIENTO	22										22
NACIMIENTO-ALTAMONT	8										8
NACIMIENTO-CONTRA COSTA	22										22
NACIMIENTO-GULLIED	10										10
NATOMAS		5									5
NATOMAS-XERORTHENTS									3		3
NEERDOBE						8					8
NEUNS-MIERUF	2										2
NEUNS-SHEETIRON	7										7
NEUS	26										26
NEUS-BAMTUSH	15										15
NEUS-GOULDING	7										7
NEUS-MARPA	9										9
NEUS-ROCK OUTCROP	3										3
NEWLANDS-ROCK OUTCROP	6										6
NEWVILLE		18									18
NEWVILLE-GULLIED		9									9
NEWVILLE-LODO		3									3
NORTHMORE			9								9
NOTNED-GERLE			2								2
NOTNED-LEDFORD			4								4
NUEVA								10			10
OAKDALE		4									4
OAKDALE-URBAN		4									4
OBSKEL-OBSTRUCTION	17										17
OBSTRUCTION	5										5
OCHREPTS-ROCK OUTCROP	2										2
OCRAIG	8										8
OCRAIG-ROCK OUTCROP	5										5
OKIOTA-DUBAKELLA	6										6
OLASHES			15								15
OMNI							8				8
ONEIDAS			12								12
ORANGEVALE		5									5
ORANGEVALE-KASEBERG		13									13
ORDFERRY			7								7
ORLAND							27				27
ORLAND-CORTINA							4				4
ORMSBY							8				8

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Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
OROSE	8										8
OROSHORE-MOUNTHOPE	32										32
OROVILLE-THERMALITO		15									15
ORTHENTS-URBAN								5			5
OSWALD						10					10
OXYAQUIC								37			37
PAIGE			16								16
PALEXERULTS	23										23
PALLS-BOHNA	6										6
PALLS-STOHLMAN	10										10
PARADISO	10										10
PARDEE	4										4
PARDEE-RANCHOSECO	23										23
PARKSHILL-FLANLY	8										8
PARRISH	12										12
PARRISH-GULLIED	8										8
PARRISH-YORKVILLE	9										9
PARROTT (Frequent)								5			5
PARROTT (Occasional)							6				6
PARROTT-VERMET								4			4
PASQUETTI							6				6
PENTZ-LITHIC	7										7
PERKINS		29									29
PESCADERO						13					13
PETERS	5										5
PILLIKEN	2										2
PILLIKEN -ROCK OUTCROP	4										4
PITS									16		16
PLACER									44		44
PLAZA					29						29
PLEASANTON			16								16
POLEBAR	3										3
POLEBAR-GULLIED	5										5
POLEBAR-MILLSHOLM	6										6
PONTO	7										7
PORTERVILLE		6									6
PORTOLA	15										15
PORTOLA-ROCK OUTCROP	2										2
POSITAS		18									18
POWELLTON-OBSTRUCTION	6										6
POWELLTON-TOADTOWN	17										17
PUTT-MCCARTHY			6								6
PUTT-ROCK OUTCROP			21								21
PUTT-ZEIBRIGHT			4								4
QUARRIES									1		1
RALSTON-ROCK OUTCROP	4										4
RAMELLI							12				12
RAMONA			10								10
REBA		4									4
RED BLUFF		11									11
RED BLUFF-REDDING		7									7
RED BLUFF-URBAN		8									8
RED BLUFF-XERARENTS		7							10		17
REDBONE	12										12
REDDING		29									29
REDDING-CORNING		20									20
REDSLUFF			15								15
REDTOUGH		4									4
REDTOUGH-FALLAGER		8									8
REDTOUGH-REDSWALE		18									18
REIFF							17				17
RESCUE	16		6								22
RESCUE-ROCK OUTCROP	7										7
RETSONGULCH-FLUMEWALL	6										6

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
RICECROSS		15									15
RINCON				6							6
RINDGE								8			8
RIVERWASH								21			21
RIVERWASH-FLUVENTS								2			2
RIZ					29						29
ROCK LAND	29										29
ROCK OUTCROP	33		23								56
ROCK OUTCROP- WACA	3										3
ROCK OUTCROP- WAPI	4										4
ROCK OUTCROP-AHWAHNEE	6										6
ROCK OUTCROP-AUBURN	6										6
ROCK OUTCROP-CHAWANAKEE	3										3
ROCK OUTCROP-CLALLAM	4										4
ROCK OUTCROP-CRYUMBREPTS	6										6
ROCK OUTCROP-DEADWOOD	4										4
ROCK OUTCROP-DUBAKELLA	14										14
ROCK OUTCROP-ECHOLAKES	13										13
ROCK OUTCROP-FRANKTOWN	3										3
ROCK OUTCROP-LITHIC XERORTHENTS	8										8
ROCK OUTCROP-ROCKBOUND	13										13
ROCK OUTCROP-RUBBLE	6										6
ROCK OUTCROP-THERMALROCKS	8										8
ROCK OUTCROP-TINKER	2										2
ROCK OUTCROP-TOIYABE	2										2
ROCK OUTCROP-WOODSEYE	3										3
ROCKLAND	1										1
ROCKSTRIPE-ULTIC HAPLOXERALFS	6										6
ROGERVILLE	31										31
ROSSMOOR							5				5
ROSSMOOR-URBAN							6				6
ROUEN	12										12
ROUGH	2										2
RUBBLE LAND	3										3
RUBBLE LAND-GLENALPINE	4										4
RUBBLE LAND-JORGE	4										4
RUBBLE LAND-ROCK OUTCROP	2										2
SACRAMENTO							34				34
SAILBOAT							23				23
SAILBOAT-URBAN							5				5
SALTCANYON			12								12
SAN JOAQUIN		71									71
SAN JOAQUIN-ARENTS		6									6
SAN JOAQUIN-COMETA		6									6
SAN JOAQUIN-DURIXERALFS		5									5
SAN JOAQUIN-GALT		11									11
SAN JOAQUIN-URBAN		20									20
SAN JOAQUIN-XERARENTS		9									9
SAN YSIDRO		4									4
SARALEGUI					4						4
SATTLEY	4										4
SATTLEY-FOPIANO	5										5
SATTLEY-FRANKTOWN	5										5
SATTLEY-SHEPAN	6										6
SCHOTT	14										14
SCHOTT-ROCK OUTCROP	8										8
SCRIBNER							22				22
SECCA-ROCK OUTCROP	6										6
SEHORN	37										37
SEHORN-ALTAMONT	9										9
SEHORN-BALCOM	14										14
SEHORN-GULLIED	6										6
SEHORN-MILLSHOLM	35										35
SERPENTINE	2										2

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
SHAKERIDGE	6										6
SHAKERIDGE-MUDWASH	19										19
SHALGRAN-ROCK OUTCROP	7										7
SHANGHAI								38			38
SHAVER	34										34
SHEDD	12										12
SHEDD-ALTAMONT	9										9
SHEETIRON	33										33
SHELD			21								21
SHELD-INVILLE			3								3
SHELD-YALLANI			3								3
SHENANDOAH		6									6
SIERRA	59										59
SIERRA-ROCK OUTCROP	9										9
SIERRAVILLE-TROJAN	3										3
SITES	196										196
SITES-JOCAL	48										48
SITES-ROCK OUTCROP	10										10
SKY	21										21
SKYHIGH-MILLSHOLM	18										18
SKYHIGH-SLEEPER	6										6
SKY-MELODY	21										21
SLACREEK-ROCK OUTCROP	8										8
SLICKENS									4		4
SLIDELAND		26									26
SMITHNECK			8								8
SMOKEY	11										11
SMOKEY-LORACK		6									6
SMOKEY-ROCK OUTCROP	3										3
SMOKEY-WOODSEYE	3										3
SNELLING		8									8
SOBOBA								6			6
SOBRANTE	45										45
SOBRANTE-ROCK OUTCROP	16										16
SOBRANTE-TIMBUCTOO	21										21
SOFGRAN-KLAUSPEAK	9										9
SOMMEYFLAT-MOUNTHOPE	13										13
STAGPOINT-DEJONAH	6										6
STOCKTON						18					18
STOHLMAN-PALLS	10										10
STONYFORD	19										19
STONYFORD-GUENOC	24										24
STONYFORD-HENNEKE	4										4
SUBACO			16								16
SUNNYVALE						12					12
SURNUF	79										79
SURNUF-BIGRIDGE	45										45
SURNUF-TAXADJUNCT	25										25
SYCAMORE							46				46
TAHOE								16			16
TAHOMA	13										13
TAHOMA -JORGE	8										8
TAHOMA-VARIENT	6										6
TAILINGS									7		7
TALLAC			56								56
TALLAC-CRYUMBREPTS			6								6
TALLAC-GULLIED			3								3
TALLAC-VARIANT			3								3
TEHAMA				49							49
TEHAMA-GULLIED				5							5
TEMO-WITEFELS	36										36
TERRACE		2									2
THERMALROCKS	7										7
THOMPSONFLAT	11										11

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
THOMPSONFLAT-OROVILLE	5										5
TINKER			1								1
TINKER-CRYUMBREPT			3								3
TINKER-ROCK OUTCROP			18								18
TINKER-TALLAC			8								8
TINNIN							3				3
TINNIN-URBAN							5				5
TISDALE						6					6
TOADTOWN-POWELLTON	38										38
TOEM-ROCK OUTCROP	13										13
TOIYABE-ROCK OUTCROP	3										3
TOOMES	6										6
TRABUCO	5										5
TRABUCO-ROCK OUTCROP	9										9
TRAINER							12				12
TROJAN	17										17
TROJAN-SATTLEY	14										14
TROSI			20								20
TROSI-SARALEGUI			12								12
TUJUNGA								10			10
TUSCAN-FALLAGER	10										10
TUSCAN-IGO	7										7
TUSCCOLL-SCHOTT	14										14
TYNDALL							22				22
TYPIC HAPLOXERALFS	30										30
TYPIC HAPLOXERULTS	5										5
TYPIC XEROFLUVENTS								9			9
TYPIC XERORTHENTS-WATER									2		2
TYSON	19										19
UBAJ			6								6
ULTIC HAPLOXERALFS	97										97
UMBREPT-TALLAC			3								3
UMPA	2										2
UMPA-CRYUMBREPTS	2										2
UMPA-ROCK OUTCROP	4										4
URBAN LAND									3		3
URBAN-NATOMAS		7									7
URBAN-XERARENTS		12									12
UVI-SMOKEY	12										12
VALDEZ							18				18
VALPAC							13				13
VALPAC-URBAN							4				4
VENADO							6				6
VINA (frequent)								9			9
VINA (occasional)							31				31
VISTAROBLES-REDDING		14									14
VLECK	4										4
VLECK-AMADOR									8		8
WACA	23										23
WACA-CRYUMBREPTS	6										6
WACA-GULLIED	3										3
WACA-LITHIC	8										8
WACA-MEISS	10										10
WACA-PORTOLA	8										8
WACA-WINDY	8										8
WACA-WOODSEYE	18										18
WAFAP-HAMSLOUGH						10					10
WALKERMINE-BOTTLEHILL	7										7
WAPI	8										8
WAPI-CHAIX	12										12
WAPI-ROCK OUTCROP	4										4
WARDCREEK-MOUNTROSE	7										7
WASHOUGAL-SKALAN	4										4
WATAH								7			7

Appendix B: Number of Map Units and Associated Soil Series

Soil Series Name	Pre-Pleist.	Older Pleist.	Latest Pleist.	Early Holo.	Mid-Holo.	Late Holo.	Latest Holo.	Hist-Mod.	Cut/Fill	Water	Total
WATER										17	17
WATERMAN	3										3
WATERMAN-ROCK OUTCROP	5										5
WATSONLAKE	24										24
WESTFAN						47					47
WET ALLUVIAL LAND								3			3
WHITECABIN			4								4
WHITECABIN-ORDFERRY			10								10
WHITEROCK	9										9
WHITTELL-JOBSIS	10										10
WICKSCORNER		5									5
WILLOWS						87					87
WILSONCREEK-TRAINER							7				7
WIND RIVER-GROVE	5										5
WINDY	15										15
WINTONER-YALLANI	2										2
WOODLEAF	24										24
WOODSEYE-ROCK OUTCROP	6										6
WOODSEYE-WACA	10										10
WYO						24					24
XERARENTS-REDDING		4									4
XERARENTS-SAN JOAQUIN		9									9
XERARENTS-URBAN		17									17
XEROFLUVENTS						4		19			23
XEROLLS		7									7
XEROPSAMMENTS									5		5
XERORTHENTS	18								30		48
XERUMBREPTS-CRYUMBREPTS			2								2
YALLANI	4										4
YALLANI-SHELD	6										6
YOLLABOLLY-FREEZEOUT	5										5
YOLLABOLLY-ROCK OUTCROP	5										5
YOLO						40					40
YORKVILLE	4										4
YUVAS		8									8
ZAMORA						34					34
ZEIBRIGHT			10								10
GRAND TOTALS	6964	518	394	66	177	907	667	504	190	18	11493

APPENDIX C

OBSIDIAN SOURCE AND HYDRATION INFORMATION FOR CALTRANS DISTRICT 3

APPENDIX C: Obsidian Source and Hydration Information

KEY	
Name1	Description
BIF	Biface
DEB	Debitage
DRL	Drill
EMF	Edge-Modified Flake
FFT	Formed Flaked Tool
FT	Flake Tool
FTL	Flake Tool
NOD	Nodule
PERF	Perforator
PPT	Projectile Point

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
05-03-51-43	Upland	UNIT 5	030-040	DEB	0.9		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 6	030-040	DEB	0.9		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 3	020-030	DEB	1.0		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 3	030-040	DEB	1.0		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 3	040-050	DEB	1.0		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 10	010-020	DEB	1.0		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 3	000-010	DEB	1.1		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 1	030-040	DEB	1.2		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 10	020-030	DEB	1.4		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 5	010-020	DEB	2.6		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 1	020-030	DEB	3.0		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 3	050-060	DEB	3.0		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 3	010-020	DEB	4.0		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 10	030-040	DEB	4.6		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 10	040-050	DEB	5.4		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 10	050-060	DEB	5.7		BODIE	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 3	010-020	DEB	3.1		MT. HICKS	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-51-43	Upland	UNIT 10	000-010	DEB	1.4		N/A	4400	10	724825	4272614	COHASSET-MCCARTHY	0 pre-Quat
05-03-53-65	Upland		000-010	DEB	0.8		BASALT	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	PPT	1.7		BASALT	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		030-040	DEB	6.0		BASALT	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	DEB	0.7		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	PPT	0.8		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		010-020	DEB	0.8		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	DEB	0.8		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	DEB	0.8		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		010-020	DEB	0.8		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	DEB	0.9		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	PPT	0.9		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	DEB	0.9		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	DEB	0.9		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		010-020	DEB	1.0		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		SURFACE	DEB	1.0		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		010-020	DEB	1.0		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	DEB	1.2		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	DEB	1.4		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	PPT	1.5		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	DEB	1.5		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	DEB	1.5		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		030-040	DEB	1.5		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		030-040	BIF	1.9		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		030-040	DEB	1.9	1.8	BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		070-080	DEB	2.1		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
05-03-53-65	Upland		030-040	DEB	2.2		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	DEB	2.2		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		030-040	DEB	2.5		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		070-080	DEB	2.6		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		040-050	DEB	2.9		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		030-040	DEB	3.3		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		010-020	DEB	3.5		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		010-020	PPT	3.5		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		050-060	DEB	3.6		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	DEB	3.7		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		070-080	DEB	4.0		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	PPT	4.7		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	DEB	4.7		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		060-070	DEB	5.2		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	DEB	6.0		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		SURFACE	DEB	6.6		BODIE	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	PPT	0.9		BORAX	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	DEB	1.5	0.8	FOX MTN	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	DEB	1.0		MT. HICKS	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	PPT	2.0		MT. HICKS	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		030-040	DEB	3.1		MT. HICKS	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		040-050	DEB	8.5		MT. HICKS	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		080-090	DEB	1.7		N/A	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		010-020	PPT	1.0		NAPA	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		030-040	PPT	1.1		NAPA	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	DEB	2.6		NAPA	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		020-030	DEB	3.6		NAPA	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		030-040	PPT	4.9		NAPA	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		070-080	DEB	5.2		NAPA	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		050-060	DEB	6.6		NAPA	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		030-040	DEB	1.1		SUTRO	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		040-050	DEB	1.7		SUTRO	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	PPT	1.9		SUTRO	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-53-65	Upland		000-010	DEB	2.2		SUTRO	5320	10	724605	4328245	WATER	0 pre-Quat
05-03-56-730	Upland	STU 30	000-010	DEB	2.4		BODIE	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	STU 27	000-010	DEB	3.0		BODIE	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	EU 3	100-110	DEB	4.0		BODIE	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	EU RQ-9	050-060	DEB	4.5		BODIE	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	EU RQ-9	050-060	DEB	5.2		BODIE	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	STU 1 1	000-010	EMF	6.0		BODIE	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	STU 27	000-010	DEB	6.0		BODIE	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	STU 30	000-010	DEB	4.5		CASA D	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	EU 21	090-100	DEB	3.4		MT. HICKS	3800	10	727029	4294991	CHAIX	0 pre-Quat

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
05-03-56-730	Upland	SURFACE	SURFACE	PPT	4.2		MT. HICKS	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	EU RQ-9	050-060	DEB	5.5		MT. HICKS	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	STU9	000-010	PPT	6.7		MT. HICKS	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	STU9	000-010	DEB	1.3		SUTRO	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-730	Upland	EU RQ-3	080-090	DEB	5.7		SUTRO	3800	10	727029	4294991	CHAIX	0 pre-Quat
05-03-56-96	Upland	UNIT 5	030-040	DEB	0.9		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 6	030-040	DEB	0.9		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 1	020-030	DEB	1.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 1	040-050	DEB	1.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 3	020-030	DEB	1.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 3	030-040	DEB	1.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 3	040-050	DEB	1.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 10	010-020	DEB	1.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 3	000-010	DEB	1.1		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	AB1	SURFACE	DEB	1.2		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 1	030-040	DEB	1.2		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 4	000-030	DEB	1.3		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 4	030-040	DEB	1.3		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 5	050-060	DEB	1.3		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 10	020-030	DEB	1.4		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 4	050-060	DEB	2.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 5	060-070	DEB	2.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 1	000-010	DEB	2.1		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 5	040-050	DEB	2.1		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 6	000-020	DEB	2.1		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 1	010-020	DEB	2.2		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 5	010-020	DEB	2.6		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 4	040-050	DEB	2.8		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 4	070-080	DEB	2.8		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 5	000-010	DEB	2.8		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 2	010-020	DEB	2.9		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 5	000-010	DEB	2.9		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 5	030-040	DEB	2.9		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	ISOLATE 30	SURFACE	DEB	3.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 1	020-030	DEB	3.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 3	050-060	DEB	3.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 8	000-010	DEB	3.4		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 8	010-020	DEB	3.4		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 4	060-070	DEB	3.6		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 6	020-030	DEB	3.7		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 3	010-020	DEB	4.0		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 5	080-090	DEB	4.1		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 5	070-080	DEB	4.2		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
05-03-56-96	Upland	UNIT 10	030-040	DEB	4.6		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 10	040-050	DEB	5.4		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 10	050-060	DEB	5.7		BODIE	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 3	010-020	DEB	3.1		MT. HICKS	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	SCU #1	SURFACE	DEB	4.0		MT. HICKS	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 10	000-010	DEB	1.4		N/A	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	UNIT 2	000-010	DEB	1.8		N/A	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-03-56-96	Upland	DSW	SURFACE	DEB	4.0		N/A	7000	10	731255	4286004	MCCARTHY-LEDMOUNT	0 pre-Quat
05-17-53-475	Upland	S1/E0	100-110	DEB	1.4		BORDWELL SPRING	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	N8/E0	020-030	DEB	1.7		BORDWELL SPRING	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	S1//W1	090-100	DEB	2.8		BORDWELL SPRING	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	N8/E0	010-020	DEB	3.1		BORDWELL SPRING	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	S1//W1	120-130	DEB	3.4		BORDWELL SPRING	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	N37/E14	000-010	DEB	2.4		GRASSHOPPER	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	N8/E0	010-020	DEB	1.8		KELLY MT.	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	S1//W1	080-090	DEB	1.4		N/A	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	S1//W1	010-020	DEB	1.7		NAPA	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	N8/E0	000-010	DEB	1.3		SOUTH WARNER	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	SURFACE	SURFACE	DEB	1.4		SOUTH WARNER	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	N8/E0	030-040	DEB	1.4		SOUTH WARNER	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	S1//W1	020-040	DEB	1.7		SOUTH WARNER	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	SURFACE	SURFACE	PPT	2.0		SOUTH WARNER	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	S1//W1	120-130	DEB	2.7		SOUTH WARNER	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	S1//W1	090-100	DEB	2.8		SOUTH WARNER	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	N8/E0	060-070	DEB	2.8		SOUTH WARNER	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	S1/E0	100-110	DEB	2.8		SOUTH WARNER	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-53-475	Upland	N8/E0	080-090	DEB	2.9		SOUTH WARNER	4200	10	684428	4369041	CROZIER-MCCARTHY	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	DEB	1.9		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	BIF	2.1		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	BIF	2.3		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	DEB	2.4		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	BIF	3.2		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	4	030-040	DEB	3.2		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	DEB	3.8		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	5	040-060	DEB	3.9		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	DEB	4.3		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	DEB	4.4		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	5	040-060	DEB	4.4		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	DEB	4.6		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	DEB	4.9		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	DEB	6.7		BODIE	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	CORE	5.5		BORAX	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat
05-17-54-215	Upland	SURFACE	SURFACE	DEB	3.7		NAPA	2000	10	715394	4338993	WACA-MEISS	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
05-19-795	Upland	CU2	000-010	DEB	1.3		BODIE	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	000-010	DEB	1.4		BODIE	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	010-020	DEB	1.4		BODIE	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	010-020	DEB	1.4		BODIE	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU6	010-020	DEB	3.0	1.4	BODIE	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU3	060-070	DEB	6.0		BODIE	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU5	000-010	DEB	6.6		BODIE	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	010-020	DEB	1.0		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	010-020	DEB	1.1		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	020-030	DEB	1.1		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	000-010	DEB	1.2		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	010-020	DEB	1.2		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	050-060	DEB	1.3		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	000-010	DEB	1.4		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	000-010	DEB	1.5		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	000-010	DEB	2.6		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU5	000-010	DEB	6.0		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU5	060-070	DEB	6.2		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU5	050-060	DEB	6.3		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU5	050-060	DEB	6.5		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	080-090	DEB	6.6		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU5	070-080	DEB	6.8		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU5	010-020	DEB	6.9		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU2	030-040	DEB	7.5		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU1	020-030	DEB	7.6		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU6	010-020	DEB	8.5		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU5	090-100	DEB	8.7		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU3	080-090	DEB	4.6		QUEEN	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU3	060-070	DEB	7.2		QUEEN	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-795	Upland	CU5	010-020	DEB	7.5		QUEEN	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-842	Upland		SURFACE	DEB	1.6		BODIE	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-842	Upland		SURFACE	DEB	2.2		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
05-19-842	Upland		SURFACE	DEB	3.9		N/A	6270	10	755498	4313591	TALLAC	2 latest-Pleist.
BUT-0294	Upland		206	PPT	3.4		TUSCAN	50.29	10	583488	4410289	FARWELL	5 late-Holo
BUT-0294	Upland		99	PPT	3.5		TUSCAN	50.29	10	583488	4410289	FARWELL	5 late-Holo
BUT-0294	Upland		69	PPT	4.3		TUSCAN	50.29	10	583488	4410289	FARWELL	5 late-Holo
BUT-0362/H	Upland			DEB	2.3		BODIE	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	110-120	DEB	3.0		BODIE	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	120-130	DEB	5.3		BODIE	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	110-120	DEB	5.4		BODIE	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	6.4		BODIE	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N10/W25	I	DRL	1.4		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	2.4		BORAX	800	10	641879	4376831	WATER	0 pre-Quat

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
BUT-0362/H	Upland			DEB	3.3		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S26.2/W13.5	SURFACE	PPT	3.4		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	3.7		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	3.8		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12.5	030-040	DEB	4.2		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12.5	020-030	DEB	4.3		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	080-090	DEB	4.7		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	4.8		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	5.3		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	5.5		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	080-090	DEB	5.6		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	5.8		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	100-115	DEB	6.4		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	130-140	DEB	6.4		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12.5	000-010	DEB	6.9		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	080-090	DEB	7.3		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	040-050	DEB	8.1		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	060-070	DEB	8.4		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S3.5/W2.5	020-030	DEB	8.4		BORAX	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N26/E42.5	030-040	DEB	3.2		BS/PP/FM	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N26/E42.5	000-010	DEB	3.9		BS/PP/FM	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	4.2		BS/PP/FM	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12.5	000-010	DEB	7.2		BS/PP/FM	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	040-050	DEB	2.5		BUFFALO HILLS	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	070-080	DEB	3.2		BUFFALO HILLS	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	3.4		BUFFALO HILLS	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	4.0		BUFFALO HILLS	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	4.4		BUFFALO HILLS	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N10/W25		BIF	6.0		BUFFALO HILLS	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12	000-010	DEB	6.4		BUFFALO HILLS	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	3.0		GRASSHOPPER	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N12.5/E19.5	030-050	DEB	3.5		GRASSHOPPER	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N26/E42.5	000-010	DEB	3.5		GRASSHOPPER	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	3.5		GRASSHOPPER	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N26/E42.5	000-010	DEB	3.6		GRASSHOPPER	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N12.5/E19.5	020-030	DEB	3.9		GRASSHOPPER	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12.5	050-060	DEB	4.2		GRASSHOPPER	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	4.2		GRASSHOPPER	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12.5	030-040	DEB	4.4		GRASSHOPPER	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12	020-030	DEB	3.4		N/A	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N26/E42.5	030-040	DEB	5.4		N/A	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12.5	010-020	DEB	6.1		N/A	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	10.9		N/A	800	10	641879	4376831	WATER	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
BUT-0362/H	Upland	c	SURFACE	BIF	1.4		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	2.4		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N26/E42.5	030-040	DEB	3.2		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	130-140	DEB	3.5		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	090-100	DEB	3.9		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	4.4		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	4.6		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12	030-040	DEB	5.0		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	5.3		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	060-070	DEB	5.3		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12	000-010	DEB	5.7		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	6.2		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S3.5/W2.5	000-010	DEB	6.6		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N13.6/W24	030-040	DEB	7.0		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	100-115	DEB	7.1		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	7.1		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	8.1		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	S7/E18.5	090-100	DEB	10.5		NAPA	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N3/W12	020-030	DEB	2.9		SOUTH WARNER	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland	N26/E42.5	000-010	DEB	3.9		SOUTH WARNER	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0362/H	Upland			DEB	5.7		SUGAR HILL	800	10	641879	4376831	WATER	0 pre-Quat
BUT-0496	Lowland	30N/30E	000-006	BIF	2.8		BORAX	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	SURFACE	SURFACE	PPT	2.9		BORAX	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	SURFACE	SURFACE	PPT	2.9		BORAX	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	BURIAL 23	008-022	PPT	3.2		BORAX	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	25N/0E	012-018	PPT	3.2		BORAX	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	30N/30E	018-024	PPT	3.2		BORAX	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	35N/20E	012-018	BIF	3.3		BORAX	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	20N/20E	006-012	PPT	3.4		BORAX	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	20N/20E	012-018	PPT	3.4		BORAX	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	SURFACE	SURFACE	PPT	3.5		BORAX	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	90N/45E	006-012	PPT	7.8		BORAX	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	25N/45W	000-006	BIF	3.7		BS/PP/FM	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	75N/50W	000-006	PPT	2.8		NAPA	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	25N/20E	000-006	BIF	3.2		NAPA	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	65N/0E	006-012	PPT	3.5		NAPA	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	30N/30E	012-018	BIF	3.6		NAPA	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	SURFACE	SURFACE	PPT	5.6		NAPA	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	30N/40E	024-030	BIF	2.5		SOUTH WARNER	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	30N/30E	018-024	PPT	1.9		TUSCAN	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-0496	Lowland	15N/0E	012-018	PPT	2.0		TUSCAN	80	10	618184	4353164	GIANELLA	6 latest-Holo
BUT-1123	Lowland	1	030-040	DEB	8.3	6.6	BORAX	90	10	618020	4356225	LIVEOAK	5 late-Holo
BUT-1123	Lowland	1	020-030	DEB	8.7	6.9	BORAX	90	10	618020	4356225	LIVEOAK	5 late-Holo

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
BUT-1123	Lowland	3	040-050	BIF	7.1		NAPA	90	10	618020	4356225	LIVEOAK	5 late-Holo
BUT-1123	Lowland	1	100-110	DEB	7.2		NAPA	90	10	618020	4356225	LIVEOAK	5 late-Holo
BUT-1123	Lowland	3	030-040	DEB	7.3		NAPA	90	10	618020	4356225	LIVEOAK	5 late-Holo
BUT-1123	Lowland	3	030-040	DEB	8.5		NAPA	90	10	618020	4356225	LIVEOAK	5 late-Holo
COL, Upper Fresh Water Site	Lowland	BANK		FT	3.6		N/A			558780	4332467	WESTFAN	5 late-Holo
COL, Upper Fresh Water Site	Lowland	BANK	195cm below slab	DEB	6.9		N/A			558780	4332467	WESTFAN	5 late-Holo
COL, Upper Fresh Water Site	Lowland	BANK	000-130	DEB	7.1		N/A			558780	4332467	WESTFAN	5 late-Holo
COL, Upper Fresh Water Site	Lowland	BANK	130-222	DEB	7.1		N/A			558780	4332467	WESTFAN	5 late-Holo
COL-001	Lowland	177	050-060	DEB	2.5		BORAX	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	060-070	DEB	0.9		GRASSHOPPER	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	060-070	DEB	4.3		GRASSHOPPER	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	010-020	DEB	0.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	030-040	DEB	0.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	040-050	DEB	0.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	060-070	DEB	0.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	010-020	DEB	1.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	020-030	DEB	1.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	020-030	DEB	1.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	020-030	DEB	1.0	4.2	NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	020-030	DEB	1.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	030-040	DEB	1.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	030-040	DEB	1.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	040-050	DEB	1.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	050-060	DEB	1.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	050-060	DEB	1.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	060-070	DEB	1.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	120-130	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	040-050	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	010-020	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	010-020	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	010-020	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	020-030	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	020-030	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	030-040	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	030-040	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	040-050	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	040-050	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	040-050	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	050-060	DEB	1.1	13.0	NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	050-060	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	050-060	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	070-080	DEB	1.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	050-060	DEB	1.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-001	Lowland	177	060-070	DEB	1.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	020-030	DEB	1.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	030-040	DEB	1.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	030-040	DEB	1.3		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	040-050	DEB	1.3		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	110-120	DEB	1.4		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	060-070	DEB	1.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	060-070	DEB	1.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	030-040	DEB	1.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	060-070	DEB	1.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	110-120	DEB	1.6	2.7	NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	060-070	DEB	1.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	140-150	DEB	1.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	140-150	DEB	1.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	010-020	DEB	1.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	120-130	DEB	1.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	040-050	DEB	1.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	040-050	DEB	1.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	040-050	DEB	1.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	020-030	DEB	1.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	060-070	DEB	2.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	080-090	DEB	2.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	060-070	DEB	2.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	090-100	DEB	2.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	060-070	DEB	2.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	050-060	DEB	2.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	050-060	DEB	2.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	050-060	DEB	2.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	120-130	DEB	2.3		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	040-050	DEB	2.3		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	080-090	DEB	2.4		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	060-070	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	060-070	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	060-070	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	060-070	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	080-090	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	080-090	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	090-100	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	090-100	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	090-100	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	090-100	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	100-110	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	100-110	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-001	Lowland	176	110-120	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	110-120	BIF	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	110-120	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	120-130	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	120-130	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	120-130	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	120-130	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	020-030	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	020-030	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	030-040	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	040-050	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	050-060	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	050-060	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	060-070	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	060-070	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	090-100	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	110-120	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	120-130	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	120-130	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	120-130	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	060-070	DEB	2.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	030-040	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	090-100	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	090-100	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	090-100	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	090-100	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	100-110	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	100-110	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	100-110	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	110-120	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	040-050	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	120-130	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	010-020	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	060-070	DEB	2.6		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	090-100	DEB	2.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	120-130	DEB	2.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	050-060	DEB	2.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	050-060	DEB	2.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	080-090	DEB	2.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	110-120	DEB	2.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	120-130	DEB	2.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	130-140	DEB	2.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	140-150	DEB	2.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-001	Lowland	17	010-020	DEB	2.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	110-120	DEB	2.8		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	120-130	DEB	2.8		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	060-070	DEB	2.8		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	080-090	DEB	2.8		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	110-120	DEB	2.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	110-120	DEB	2.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	120-130	DEB	2.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	140-150	DEB	2.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	040-050	DEB	2.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	100-110	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	020-030	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	020-030	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	020-030	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	040-050	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	090-100	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	110-120	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	120-130	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	120-130	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	130-140	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	130-140	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	010-020	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	010-020	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	020-030	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	030-040	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	040-050	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	070-080	DEB	3.0		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	020-030	DEB	3.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	050-060	DEB	3.1		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	020-030	DEB	3.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	110-120	BIF	3.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	040-050	DEB	3.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	080-090	DEB	3.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	110-120	DEB	3.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	120-130	DEB	3.2		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	050-060	DEB	3.3		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	020-030	DEB	3.4		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	080-090	DEB	3.4		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	020-030	DEB	3.4		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	110-120	DEB	3.4		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	110-120	DEB	3.4		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	120-130	DEB	3.4		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	030-040	DEB	3.4		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-001	Lowland	17	050-060	DEB	3.4		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	176	110-120	DEB	3.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	020-030	DEB	3.5		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	060-070	DEB	3.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	17	070-080	DEB	3.7		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	050-060	DEB	4.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-001	Lowland	177	130-140	DEB	4.9		NAPA	35	10	600499	4312980	GRANDBEND	6 latest-Holo
COL-076	Upland	7	000-010	DEB	3.4		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	000-010	DEB	4.1		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	010-020	DEB	4.3		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	010-020	DEB	4.3		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	020-030	DEB	4.4		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	020-030	DEB	4.5		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	020-030	DEB	4.6		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	030-040	DEB	4.6		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	010-020	DEB	4.9		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	010-020	DEB	4.9		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	010-020	DEB	5.0		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	010-020	DEB	5.1		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	020-030	DEB	5.1		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	050-060	DEB	5.2		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	040-050	DEB	5.3		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	020-030	DEB	5.4		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	000-010	DEB	5.5		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	000-010	DEB	5.5		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	010-020	DEB	5.5		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	030-040	DEB	5.5		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	050-060	DEB	5.5		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	010-020	DEB	5.6		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	050-060	DEB	5.6		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	020-030	DEB	5.8		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	UNIT 7	000-010	DEB	6.6		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	040-050	DEB	6.6		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	020-030	DEB	6.7		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	040-050	DEB	6.7		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	030-040	DEB	6.9		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	050-060	DEB	6.9		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	060-070	DEB	6.9		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	010-020	DEB	7.0		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	050-060	DEB	7.1		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	000-010	DEB	7.2		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	020-030	DEB	7.2		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	030-040	DEB	7.2		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-076	Upland	7	030-040	DEB	7.2		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	030-040	DEB	7.2		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	000-010	DEB	7.6		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	000-010	DEB	7.7		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	040-050	DEB	7.9		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	040-050	DEB	8.1		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	030-040	DEB	8.3		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	020-030	BIF	8.6		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	040-050	DEB	9.0		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	000-010	DEB	9.3		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-076	Upland	7	040-050	DEB	10.6		BORAX	1380	10	533707	4357923	STONYFORD-GUENOC	0 pre-Quat
COL-081	Upland	1	88	PPT	3.3		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	040-050	DEB	3.5		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	080-090	DEB	4.1		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	060-070	DEB	4.2		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	060-070	DEB	4.2		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	100-110	DEB	4.2		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	020-030	DEB	4.3		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	080-090	DEB	4.3		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	080-090	DEB	4.3		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	1	72	BIF	4.4		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	080-090	DEB	4.4		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	060-070	DEB	4.5		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	060-070	DEB	4.6		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	100-110	DEB	4.6		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	120-130	DEB	4.6		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	120-130	DEB	4.6		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	020-030	DEB	4.7		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	020-030	DEB	4.7		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	040-050	DEB	4.7		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	040-050	DEB	4.7		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	4	060-070	PPT	4.8		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	105	PPT	4.9		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	080-090	DEB	4.9		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	080-090	DEB	5.0		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	060-070	DEB	5.1		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	020-030	DEB	5.2		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	2	040-050	BIF	5.3		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	020-030	DEB	5.7		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	040-050	DEB	5.9		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	100-110	DEB	6.5		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	000-010	DEB	6.6		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	100-110	DEB	6.8		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-081	Upland	8	080-090	DEB	7.2		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	000-010	DEB	7.5		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	040-050	DEB	7.9		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	000-010	DEB	8.0		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	020-030	DEB	9.3		BORAX	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	060-070	DEB	3.2		GRASSHOPPER	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	040-050	DEB	2.4		MT. KONOCTI	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	040-050	DEB	2.8		MT. KONOCTI	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	020-030	DEB	3.1		MT. KONOCTI	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	000-010	DEB	3.6		MT. KONOCTI	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	4	76	PPT	3.8		MT. KONOCTI	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	000-010	DEB	1.5		NAPA	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	060-070	DEB	4.7		NAPA	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	040-050	DEB	4.8		NAPA	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-081	Upland	8	000-010	DEB	5.7		NAPA	1200	10	528635	4359018	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-158	Upland	Stege B; Unit B 2	20-30	DEB	1.3	3.7	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	M-7 Upper Midden	--	PPT	1.3	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Backdirt	--	PPT	1.4	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	StegeB; B2	20-Oct	PPT	1.5	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	StegeB; B1	60-70	PPT	1.6	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; Unit B 2	20-Oct	DEB	2.2	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; Unit B 1	20-Oct	DEB	2.4	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege A Al	40-50	PPT	2.4	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	M-7 Mixed	--	PPT	2.6	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; Unit B 1	20-Oct	DEB	2.7	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	M-7 Lower Midden	--	PPT	2.8	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; Unit B 1	20-30	DEB	2.9	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	M-7 Lower Midden	--	PPT	3.0	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	CCCH	--	PPT'	3.2	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Lower Midden	--	DEB	3.5	9.9	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Lower Midden	--	DEB	3.7	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Lower Midden	--	DEB	3.7	6.6	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; Unit B 2	20-Oct	DEB	3.7	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; Unit B 2	70-85	DEB	3.7	6.2	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; Unit B 1	40-50	DEB	3.9	6	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; Unit B 1	20-Oct	DEB	4.1	5.8	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; Unit B 2	20-Oct	DEB	5.1	NM	BORAX	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; Unit B 2	85-90	DEB	3.0	NM	GRASSHOPPER	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Backdirt	--	PPT	1.4	NM	NAPA	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	CCCH	--	PPT	1.4	NM	NAPA	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Backdirt	--	PPT	1.5	NM	NAPA	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; B2	100-110	PPT	1.5	NM	NAPA	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	CCCH	--	PPT	1.5	NM	NAPA	21	10	583550	4356557	VINA (occasional)	6 latest-Holo

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-158	Upland	Backdirt	--	PPT	1.5	NM	NAPA	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	M-7 Mixed	--	PPT	2.6	NM	NAPA	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	M-7 Mixed	--	PPT	3.0	NM	NAPA	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	Stege B; Unit B 2	85-90	DEB	2.1	NM	TUSCAN	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-158	Upland	ResRd Unit A	40-50	PPT	3.5	NM	TUSCAN	21	10	583550	4356557	VINA (occasional)	6 latest-Holo
COL-160	Upland	N0iW2/20-30	020-030	DEB	1.2		ANNADEL	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	S50jW9/50-60	050-060	BIF	2.4		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	010-020	DEB	2.5		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0 i 112/20-30	020-030	DEB	3.0	5.0	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	010-020	PPT	3.0		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	SURFACE	SURFACE	PPT	3.1		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2/80-90	080-090	DEB	3.2	4.6	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0i1I2/20-30	020-030	DEB	3.4		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	020-030	DEB	3.6		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	150-160	FTL	3.7	4.9	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	020-030	DEB	3.7		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	070-080	DEB	3.7	4.9	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	020-030	DEB	3.8		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	020-030	DEB	3.9		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	S50iW9/40-50	040-050	DEB	3.9	4.8	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	4.0		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	4.0	7.0	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	4.0	5.7	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0 i 112/20-30	020-030	DEB	4.1		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2/70-B0	070-080	DEB	4.4	6.6	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0jW2/10-20	010-020	FTL	4.5		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	020-030	DEB	4.6		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	SURFACE	SURFACE	EMF	4.6		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	000-010	DEB	4.7		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	020-030	DEB	4.7		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	060-070	BIF	4.8	6.2	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	110-120	BIF	4.8	6.5	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0;1I2/20-30	020-030	DEB	4.8		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2/80-90	080-090	DEB	4.8	5.8	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	S50iW9	050-060	DEB	4.8		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	4.9	7.5	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2/30-40	030-040	DEB	5.0	6.3	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	5.1	6.8	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2/30-40	030-040	DEB	5.1		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0 i 112/80-90	080-090	DEB	5.2	7.1	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2!20-30	020-030	BIF	5.3		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	H0:1I2	020-030	DEB	5.3		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	100-110	DEB	5.4	7.3	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-160	Upland	Xfl5610	020-030	DEB	5.5		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	5.6	7.8	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0i1l2/20-30	020-030	DEB	5.7	6.6	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2	010-020	BIF	5.7		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	020-030	DEB	5.8		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0 i 112/20-30	020-030	DEB	5.8		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0: 112120-30	020-030	DEB	5.9		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2/80-90	080-090	DEB	5.9		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	140-150	DEB	5.9	8.3	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	000-010	BIF	5.9		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	130-140	FTL	6.0	8.7	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	080-090	DEB	6.0		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	6.1		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	100-110	DEB	6.2		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0 i 112/20-30	020-030	DEB	6.4		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0;1l2/80-90	080-090	DEB	6.4		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0i1l2/80-90	080-090	DEB	6.4	9.0	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	FTL	6.5	8.5	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	140-150	FTL	6.6	8.2	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0 i 112120-30	020-030	DEB	6.6		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	110-120	BIF	6.8	9.1	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2/80-90	080-090	DEB	6.8		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	140-150	DEB	7.0	8.7	BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	040-050	BIF	7.3		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0i1l2/80-90	080-090	DEB	7.4		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	7.6		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	H0ill2	080-090	DEB	7.6		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0i1l2/80-90	080-090	DEB	7.7		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	8.4		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	8.8		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	9.1		BORAX	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	SURFACE	SURFACE	BIF	2.0		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	TI5Bi2B-29/0-10	000-010	DEB	2.1		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	S50iW9/10-20	010-020	DEB	2.2		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	S50iW9/20-30	020-030	DEB	2.3		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2/10-20	010-020	DEB	2.5		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	060-070	DEB	2.7	3.7	MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2/30-40	030-040	DEB	2.9		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0jW2/30-40	030-040	DEB	2.9		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	010-020	DEB	3.0		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	S50iW9/0-1/0	000-010	DEB	3.1		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	130-140	DEB	3.4		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0jW2l40-50	040-050	DEB	3.7		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-160	Upland	Xfl5610	140-150	BIF	3.7	5.7	MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	060-070	DEB	3.7		MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	030-040	DEB	3.8	4.8	MT. KONOCTI	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	070-080	DEB	3.7		NAPA	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0jW2l60-70	060-070	DEB	3.7		NAPA	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2/60-70	060-070	DEB	3.8		NAPA	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	S50iW9/30-40	030-040	DEB	4.1		NAPA	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	070-080	DEB	4.3		NAPA	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0jW2/50-60	050-060	DEB	4.4		NAPA	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2l60-70	060-070	DEB	4.8		NAPA	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	S50iW9/30-40	030-040	DEB	5.3		NAPA	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	N0iW2l30-40	030-040	DEB	5.4		NAPA	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-160	Upland	Xfl5610	120-130	DEB	5.8		NAPA	1450	10	536124	4348709	ETSEL-MAYMEN-MARPA	0 pre-Quat
COL-165	Upland	65N/66W	020-030	DEB	4.0		BORAX	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	44N/54W	SURFACE	PPT	4.3		BORAX	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	040-050	DEB	4.7		BORAX	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	SURFACE	BIF	5.1	4.4	BORAX	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	010-020	DEB	5.9		BORAX	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	030-040	DEB	6.1		BORAX	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	020-030	DEB	6.2		BORAX	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	48N/55W	SURFACE	PPT	6.4		BORAX	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	040-050	DEB	6.4		BORAX	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	030-040	DEB	7.5		BORAX	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	010-020	BIF	3.6		MT. KONOCTI	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	020-030	DEB	2.5		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	000-010	DEB	2.7		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	000-010	DEB	3.0		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	030-040	DEB	3.0		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	000-010	DEB	3.2		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	020-030	DEB	3.5		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	010-020	DEB	3.5	2.3	NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	020-030	DEB	3.5		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	030-040	DEB	3.5		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	030-040	DEB	3.6		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	020-030	DEB	3.6		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	030-040	DEB	3.7		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	020-030	DEB	3.8		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	010-020	DEB	3.9		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	000-010	DEB	3.9		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	040-050	DEB	3.9		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	010-020	DEB	4.1		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	020-030	BIF	4.2		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	040-050	DEB	4.3		NAPA	395	10	576426	4313044	CORNING	1 EP-LP

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-165	Upland	65N/66W	030-040	DEB	4.4		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	000-010	DEB	4.5		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	040-050	DEB	4.5		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	010-020	DEB	4.7		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	030-040	DEB	4.7		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	030-040	DEB	4.7		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	000-010	DEB	4.8		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	020-030	DEB	5.0		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	030-040	DEB	5.0		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	000-010	DEB	5.0		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	040-050	DEB	5.0		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	020-030	DEB	5.1		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	030-040	DEB	5.1		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	030-040	DEB	5.1		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	010-020	DEB	5.2		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	030-040	DEB	5.5		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	000-010	DEB	5.5		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	040-050	DEB	5.5		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	040-050	DEB	5.5		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	010-020	DEB	5.6		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	010-020	DEB	5.6		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	010-020	DEB	5.7		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	010-020	DEB	5.7		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	010-020	DEB	6.1		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	010-020	DEB	6.3		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	50N/56W	030-040	DEB	9.4		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	020-030	DEB	10.6		NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-165	Upland	65N/66W	040-050	DEB	11.3	10.7	NAPA	395	10	576426	4313044	CORNING	1 EP-LP
COL-178	Upland	5N/0W	000-010	DEB	1.2		BORAX	400	10	576335	4313130	CORNING	1 EP-LP
COL-178	Upland	53N/0W	010-020	DEB	5.3		BORAX	400	10	576335	4313130	CORNING	1 EP-LP
COL-178	Upland	40N/0W	000-010	DEB	5.9		BORAX	400	10	576335	4313130	CORNING	1 EP-LP
COL-178	Upland	45N/0W	000-010	DEB	1.2		NAPA	400	10	576335	4313130	CORNING	1 EP-LP
COL-178	Upland	57N/0W	010-020	DEB	1.7		NAPA	400	10	576335	4313130	CORNING	1 EP-LP
COL-178	Upland	I7N/0W	000-010	DEB	3.3		NAPA	400	10	576335	4313130	CORNING	1 EP-LP
COL-178	Upland	53N/0W	030-040	DEB	3.4		NAPA	400	10	576335	4313130	CORNING	1 EP-LP
COL-178	Upland	14N/1W	020-030	DEB	3.7		NAPA	400	10	576335	4313130	CORNING	1 EP-LP
COL-178	Upland	53N/0W	020-030	DEB	4.4		NAPA	400	10	576335	4313130	CORNING	1 EP-LP
COL-178	Upland	53N/0W	020-030	DEB	5.0		NAPA	400	10	576335	4313130	CORNING	1 EP-LP
COL-178	Upland	40N/0W	000-010	DEB	7.0		NAPA	400	10	576335	4313130	CORNING	1 EP-LP
COL-245/H	Lowland	Backfill		DEB	1.8	8.9	BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		DEB	2.3	8.9	BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		DEB	2.3		BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		DEB	2.5		BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-245/H	Lowland	Backfill		DEB	2.6		BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		DEB	2.7	10.4	BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		DEB	2.8		BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		DEB	2.8	12.2	BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		DEB	2.8		BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		DEB	2.9	3.7	BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		DEB	3.0		BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		DEB	3.3		BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		DEB	7.8		BORAX	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	1.4		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	1.4		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		NOD	1.4	2.1	NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	1.5		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	1.5		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		NOD	1.5		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		NOD	1.5	4.6	NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		NOD	1.5		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	1.6		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	1.6		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	1.6		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	1.6		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		NOD	1.6		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	1.7		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	1.9		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	1.9		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		NOD	1.9		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		NOD	1.9	7.3	NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Stratum 3		NOD	2.0	3.7	NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	2.1	7.1	NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	2.3		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	2.6		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-245/H	Lowland	Backfill		NOD	3.1		NAPA	17.98	10	585222	4341262	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	1.5		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	1.7		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	2.3		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	2.6		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	2.8		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	3.0		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	3.0		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	3.3	4.6	BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	3.5		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	3.6	6.1	BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	4.2		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-246/H	Lowland	Lower Midden		DEB	5.2		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	5.3		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	7.0		BORAX	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-246/H	Lowland	Lower Midden		DEB	3.7		GRASSHOPPER	17.98	10	585620	4340907	VINA (occasional)	6 latest-Holo
COL-247	Lowland	B5	90-100	DEB	5.0	NM	BODIE	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B6	80-90	DEB	0.9	NM	BORAX	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	A2	90-100	PPT	1.3	NM	BORAX	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B2	50-60	PPT	3.5	8.11	BORAX	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B3	60-70	PPT	4.5	NM	BORAX	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	A17	30-40	PPT	4.6	NM	BORAX	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	A3	100-110	DEB	4.6	NM	BORAX	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B4	60-70	DEB	5.3	NM	BORAX	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B2	50-60	PPT	5.9	NM	BORAX	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B1	100-110	PPT	6.1	NM	BORAX	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B4	90-100	DEB	6.3	NM	BORAX	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B6	90-100	DEB	1.2	NM	MT. KONOCTI	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B5	80-90	DEB	4.4	NM	MT. KONOCTI	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	1.3	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	1.7	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	2.4	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	3.5	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	3.6	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	3.6	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	3.7	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	3.7	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	3.8	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	4.4	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	4.4	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	4.4	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B2	20-Oct	DEB	4.7	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	5.1	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	5.2	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	5.4	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	6.1	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	6.3	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	DEB	11.9	NM	N/A	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B4	0-10	DEB	1.2	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	--	--	PPT	1.4	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B2	20-30	NOD	1.5	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B4	90-100	DEB	1.5	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B4	20-30	DEB	1.9	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B4	80-90	DEB	2.4	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	A2	120-130	DEB	3.0	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
COL-247	Lowland	B3	100-110	DEB	3.3	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B3	20-30	DEB	3.3	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B3	80-90	DEB	4.0	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	A3	120-130	DEB	4.1	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	A2	120-130	DEB	4.2	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B3	60-70	DEB	4.5	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B5	80-90	DEB	4.5	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B5	90-100	DEB	4.5	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B5	90-100	DEB	4.5	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B6	70-80	DEB	4.6	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B6	100-11 0	DEB	5.2	NM	NAPA	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B6	90-100	PPT	1.3	NM	TUSCAN	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B2	90-100	DEB	1.5	NM	TUSCAN	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B6	100-110	DEB	2.8	NM	TUSCAN	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B4	90-100	DEB	3.3	NM	TUSCAN	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	A3	140-150	NOD	3.5	NM	TUSCAN	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B5	0-10	NOD	3.5	NM	TUSCAN	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	A3	120-130	NOD	3.6	NM	TUSCAN	19.81	10	583190	4350479	MOONBEND	5 late-Holo
COL-247	Lowland	B2	20-40	NOD	5.3	NM	TUSCAN	19.81	10	583190	4350479	MOONBEND	5 late-Holo
ELD-145	Upland	CU 8	020-030	PPT	2.2		ANNADEL	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	020-030	PPT	2.2		ANNADEL	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	020-030	DEB	1.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	1.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	1.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	1.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	030-040	DEB	1.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	1.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	1.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	1.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	090-100	PPT	1.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	1.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	040-050	PPT	1.9	5.3	BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	1.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	1.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	090-100	PPT	1.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	040-050	PPT	1.9	5.3	BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	2.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	2.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	2.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	020-030	DEB	2.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	2.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	2.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	2.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-145	Upland	CU 14	030-040	DEB	2.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	2.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	2.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	2.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	2.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	2.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	2.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	2.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	2.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	030-040	DEB	2.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	030-040	DEB	2.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	2.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	2.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	2.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	070-080	DEB	2.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	2.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	2.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 1	040-050	BIF	2.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	010-020	DEB	2.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	040-050	DEB	2.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 1	040-050	BIF	2.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	070-080	PPT	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	020-030	DEB	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	110-120	BIF	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	110-120	BIF	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	070-080	PPT	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	110-120	BIF	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	110-120	BIF	2.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	2.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	2.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	2.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	2.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	2.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	2.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	030-040	DEB	2.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	2.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-145	Upland	CU 7	060-070	BIF	2.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	020-030	DEB	2.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	2.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	190-200	DEB	2.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 3	010-020	PPT	2.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	2.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	080-090	DEB	2.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 3	010-020	PPT	2.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	060-070	BIF	2.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	3.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	3.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	3.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	3.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	3.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	3.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	3.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	3.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	3.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	3.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	180-190	DEB	3.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	3.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 5	020-030	PPT	3.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	030-040	DEB	3.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	A 6		PPT	3.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 5	020-030	PPT	3.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	A 6		PPT	3.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	3.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	3.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	3.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	3.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	3.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	060-070	BIF	3.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	070-080	DEB	3.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	080-090	DEB	3.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	090-100	DEB	3.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	DEB	3.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	060-070	BIF	3.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	3.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	3.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	3.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	3.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	3.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	020-030	DEB	3.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-145	Upland	CU 6	030-040	DEB	3.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	3.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	3.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	030-040	DEB	3.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	3.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	3.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	180-190	DEB	3.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	040-050	DEB	3.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	040-050	DEB	3.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	070-080	DEB	3.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	070-080	DEB	3.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	180-190	DEB	3.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	3.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	3.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	3.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	3.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	3.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	3.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	3.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	3.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	3.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	3.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	3.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	3.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	180-190	DEB	3.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	180-190	DEB	3.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	180-190	DEB	3.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	3.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	090-100	DEB	3.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 10	040-050	BIF	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	040-050	BIF	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	030-040	DEB	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	070-080	DEB	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 10	040-050	BIF	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	040-050	BIF	3.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	3.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	3.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-145	Upland	CU 6	030-040	DEB	3.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	3.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	3.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	040-050	DEB	3.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	DEB	3.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	DEB	3.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	3.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	020-030	DEB	4.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	4.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	4.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	4.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	4.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	DEB	4.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	030-040	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	190-200	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	030-040	DEB	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	060-070	BIF	4.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	180-190	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-145	Upland	CU 14	070-080	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	090-100	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	090-100	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	DEB	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	060-070	BIF	4.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	4.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	030-040	DEB	4.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	040-050	DEB	4.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	190-200	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 5	110-120	BIF	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	070-080	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	080-090	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	080-090	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	080-090	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	080-090	DEB	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 5	110-120	BIF	4.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	020-030	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-145	Upland	CU 14	050-060	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	080-090	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	DEB	4.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	020-030	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	190-200	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	030-040	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	030-040	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	090-100	DEB	4.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	070-080	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	020-030	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	030-040	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	190-200	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	040-050	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	070-080	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	090-100	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	DEB	4.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-145	Upland	CU 7	040-050	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	4.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	020-030	DEB	4.8	5.7	BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	BIF	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	030-040	DEB	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	040-050	DEB	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	090-100	DEB	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	BIF	4.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	030-040	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	040-050	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	070-080	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	090-100	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	090-100	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	DEB	5.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-145	Upland	CU 6	020-030	DEB	5.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	5.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	5.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	DEB	5.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	5.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	5.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	5.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	5.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	5.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	5.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	5.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	5.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	000-010	PPT	5.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	040-050	DEB	5.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	090-100	DEB	5.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	060-070	BIF	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	190-200	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	070-080	DEB	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	000-010	PPT	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	060-070	BIF	5.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	5.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	160-170	DEB	5.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	020-030	DEB	5.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	020-030	DEB	5.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	030-040	DEB	5.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	5.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 5	110-120	PPT	5.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	030-040	DEB	5.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	070-080	DEB	5.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 5	110-120	PPT	5.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	5.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	150-160	DEB	5.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	030-040	DEB	5.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-145	Upland	CU 14	030-040	DEB	5.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	090-100	DEB	5.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	5.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	5.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	5.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	5.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	110-120	DEB	5.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	5.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	5.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	020-030	DEB	5.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	5.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	5.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	5.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	190-200	DEB	5.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 10	060-070	BIF	5.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 10	060-070	BIF	5.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	5.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	070-080	DEB	5.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	6.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	030-040	DEB	6.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	180-190	DEB	6.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	050-060	DEB	6.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	6.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	6.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	6.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	6.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	6.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	6.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	6.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	6.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	080-090	DEB	6.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	6.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	6.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	6.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	6.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	110-120	DEB	6.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	050-060	DEB	6.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	6.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	050-060	DEB	6.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	100-110	DEB	6.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	6.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	7.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	030-040	DEB	7.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-145	Upland	CU 6	090-100	DEB	7.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	080-090	DEB	7.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	7.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	080-090	DEB	7.3		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	DEB	7.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	090-100	DEB	7.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	020-030	DEB	7.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	040-050	DEB	8.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	BIF	8.1		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	020-030	DEB	8.2		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	100-110	DEB	8.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	080-090	DEB	8.4		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	030-040	DEB	8.5		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	110-120	BIF	8.7		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	110-120	BIF	8.8		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	080-090	DEB	9.6		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	100-110	BIF	9.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	100-110	BIF	9.9		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	060-070	DEB	11.0		BODIE	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	040-050	BIF	5.5		BS/PP/FM	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 6	040-050	BIF	5.5		BS/PP/FM	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 10	060-070	BIF	2.8		MT. HICKS	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 10	060-070	BIF	2.8		MT. HICKS	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	020-030	DEB	4.1		MT. HICKS	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	020-030	DEB	4.1		MT. HICKS	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	050-060	PPT	1.7		N/A	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	050-060	PPT	1.7		N/A	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	060-070	BIF	2.6		N/A	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	060-070	BIF	2.7		N/A	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	170-180	BIF	4.4		N/A	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	030-040	DEB	1.8		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	030-040	DEB	1.8		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	STU 1		PPT	2.8		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	STU 1		PPT	2.8		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	040-050	BIF	3.3		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	040-050	BIF	3.3		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	100-110	BIF	5.5		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	140-150	PPT	5.5		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	140-150	PPT	5.5		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 12	100-110	BIF	5.5		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	7.6		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 2	090-100	DEB	7.6		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 14	100-110	BIF	8.1		NAPA	3000	10	701124	4290061	COHASSET	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-145	Upland	CU 8	060-070	BIF	3.5		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 3	040-050	BIF	3.5		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 5	040-050	BIF	3.5		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	060-070	BIF	3.5		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 3	040-050	BIF	3.5		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 5	040-050	BIF	3.5		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 3	060-070	BIF	4.0		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 3	060-070	BIF	4.0		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	060-070	BIF	4.3		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	060-070	BIF	4.3		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 3	060-070	BIF	4.5		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 3	060-070	BIF	4.5		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	170-180	BIF	4.7		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 7	170-180	BIF	4.7		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	060-070	BIF	5.3		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-145	Upland	CU 8	060-070	BIF	5.3		SUTRO	3000	10	701124	4290061	COHASSET	0 pre-Quat
ELD-179	Upland	1	020-030	DEB	0.8		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	000-010	DEB	0.8		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	3	030-040	DEB	1.1		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	5	010-020	DEB	1.1		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	010-020	DEB	1.2		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	020-030	DEB	1.3		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	0	0	PPT	1.5		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	8	020-030	DEB	1.9		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	5	020-030	DEB	2.0		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	000-010	DEB	2.0		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	8	030-040	DEB	2.0		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	8	010-020	DEB	2.1		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	1	050-060	DEB	2.3		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	8	050-060	PERF	2.3		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	8	040-050	DEB	2.7		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	100-110	DEB	2.8		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	030-040	DEB	2.9		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	5	000-010	DEB	3.0		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	070-080	FTL	3.3		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	040-050	DEB	3.4		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	060-070	DEB	3.4		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	090-100	DEB	3.6		BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	080-090	DEB	6.1	3.7	BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	070-080	FTL	10.2	3.9	BODIE	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	3	010-020	FTL	1.4		N/A	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-179	Upland	9	050-060	DEB	3.4		NAPA	6270	10	755316	4313444	TALLAC	2 latest-Pleist.
ELD-180	Upland	0	0	PPT	0.8		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-180	Upland	3	000-010	FTL	0.8		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	1	000-010	DEB	0.9		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	1	030-040	DEB	0.9		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	7	000-010	DEB	1.0		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	7	020-030	FTL	1.0		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	4	0	BIF	1.1		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	7	030-040	PPT	1.2		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	7	010-020	DEB	1.3		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	4	000-010	DEB	1.5		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	7	040-050	DEB	2.1		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	6	030-040	DEB	2.2		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	6	000-010	DEB	2.3		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	6	020-030	DEB	2.7		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	1	020-030	DEB	2.8		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	6	010-020	DEB	3.1		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	4	030-040	DEB	4.1		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	3	040-050	DEB	4.2		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	9	020-030	DEB	4.2		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	4	000-010	PPT	4.7		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	1	060-070	DEB	5.1		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	2	000-010	DEB	5.2		BODIE	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	4	030-040	DEB	1.2		N/A	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	9	010-020	DEB	1.2		N/A	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	4	020-030	DEB	1.4		N/A	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	7	050-060	DEB	1.5		N/A	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	4	000-010	DEB	1.7		N/A	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	4	010-020	DEB	1.8		N/A	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-180	Upland	2	030-040	DEB	4.9		N/A	6270	10	755077	4313493	TALLAC	2 latest-Pleist.
ELD-184	Upland	5	050-060	BIF	1.7		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	7	010-020	DEB	1.8		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	1	010-020	DRL	2.2		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	5	050-060	PPT	2.6		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	3	000-010	PPT	3.1		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	2	000-012	PPT	3.5		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	4	040-050	DEB	3.7		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	2	050-060	DEB	4.1		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	3	040-050	PPT	4.6		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	7	060-070	DEB	4.7		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	4	070-080	DEB	4.9		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	7	020-030	DEB	6.2		BODIE	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	7	000-010	DEB	2.8		MONO	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	5	030-040	BIF	4.4		MT. HICKS	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	UNIT 5	070-080	PPT	1.2		N/A	6230	10	755337	4313764	TALLAC	2 latest-Pleist.

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-184	Upland	5	070-080	BIF	1.2		N/A	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	11	060-070	DEB	4.6		N/A	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	5	010-020	DEB	6.0		N/A	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	UNIT 7	020-030	DEB	6.2		N/A	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-184	Upland	11	040-050	DEB	6.3		N/A	6230	10	755337	4313764	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 8	020-030	DEB	1.3		BODIE	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 4	000-010	DEB	2.3		BODIE	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland		SURFACE	PPT	4.0		BODIE	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 4	010-020	DEB	4.0		BODIE	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 3	020-030	DEB	4.9		BODIE	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 4	010-020	DEB	5.0		BODIE	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 5	020-030	DEB	5.0		BODIE	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland		SURFACE	FT	5.3		BODIE	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 4	000-010	DEB	5.5		BODIE	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	STU 3	000-025	DEB	5.7		BODIE	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 4	010-020	DEB	1.2		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	STU 5	000-014	DEB	1.4		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 5	000-010	DEB	1.4		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 8	010-020	DEB	2.3		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	STU 3	000-025	DEB	2.8		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 4	010-020	DEB	2.8		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 8	030-040	DEB	3.2		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 4	000-010	DEB	3.7		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 4	000-010	DEB	3.7		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 4	010-020	DEB	3.7		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	STU 3	000-025	DEB	3.9		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	STU 5	000-014	DEB	3.9		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 3	000-010	DEB	4.9		N/A	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-2203/H	Upland	EU 5	000-010	DEB	3.0		SUTRO	5400	10	755875	4311569	TALLAC	2 latest-Pleist.
ELD-44	Upland	TR A SQ 2	030-061		3.3		NAPA	1280	10	677231	4286192	RESCUE	2 latest-Pleist.
ELD-616/H	Upland	9	020-030	BIF	2.5		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	5	140-150	DEB	3.5		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	000-010	DEB	3.7		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	1	010-040	DEB	3.8		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	020-030	DEB	3.9		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	060-070	DEB	3.9		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	120-130	DEB	4.1		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	4	010-020	DEB	4.4		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	000-010	DEB	4.6		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	090-100	BIF	4.6		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	040-050	DEB	5.0		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	100-110	DEB	5.0		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	070-080	DEB	5.2		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-616/H	Upland	2	110-120	DEB	5.2		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	140-150	DEB	5.2		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	000-010	DEB	5.5		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	060-070	DEB	5.5		BODIE	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	030-040	DEB	4.8		BORAX	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	070-080	PPT	5.7		BORAX	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	010-020	DEB	2.6		MT. HICKS	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	1	010-040	DEB	5.2		MT. HICKS	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	110-120	DEB	5.4		MT. HICKS	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	070-080	DEB	1.2		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	9	000-010	DEB	1.2		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	9	080-090	DEB	3.0		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	050-060	DEB	3.2		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	9	010-020	DEB	3.6		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	000-010	DEB	3.8		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	090-100	DEB	3.8		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	9	070-080	BIF	3.8		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	010-020	DEB	4.0		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	040-050	DEB	4.2		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	070-080	DEB	4.3		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	1	010-040	BIF	4.7		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	120-130	DEB	4.8		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	130-140	DEB	5.0		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	040-050	DEB	5.1		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	090-100	DEB	5.2		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	120-130	DEB	5.3		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	120-130	DEB	5.4		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	9	060-070	DEB	5.7		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	7	020-030	DEB	5.8		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	050-060	DEB	5.9		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	130-140	DEB	5.9		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	110-120	DEB	8.6		N/A	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	120-130	DEB	2.4		NAPA	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	000-010	DEB	3.2		NAPA	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	120-130	DEB	3.6		NAPA	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	5	090-100	DEB	3.9		NAPA	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	1	010-040	DEB	4.8		NAPA	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-616/H	Upland	2	110-120	DEB	5.6		NAPA	1200	10	672284	4307364	BOOMER	0 pre-Quat
ELD-851/H	Upland	S 19/E0	010-020	DEB	1.1		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S10.5/E0	010-020	DEB	1.8		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S26/E17	000-010	DEB	1.8		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 19/E0	060-070	DEB	1.9		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S35/W.5	020-030	DEB	2.3		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
ELD-851/H	Upland	S18.5/W4.55	030-040	PPT	3.0		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	516/E4	030-040	CORE	3.3		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 19/E0	040-050	CORE	3.5		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S/E 1 7	050-060	DEB	3.5		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S35/W.5	020-030	DEB	3.6		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S35/W.5	020-030	DEB	3.6		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	59.5/E3.6	020-030	PPT	3.8	6.5	BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S26/E17	030-040	DEB	3.9		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 16/E4	020-030	DEB	4.2		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	519.5/W7	010-020	DEB	4.3		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S26/E17	050-060	DEB	4.5		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S26.5/W12.1	000-010	DEB	4.6		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S26/E17	050-060	DEB	4.6		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	526/E17	060-070	DEB	4.6	4.2	BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S26.5/W12.1	010-020	DEB	4.8		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 16/E4	000-010	DEB	4.8		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 19/E0	000-010	DEB	4.8		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 19/E0	000-010	DEB	5.0		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S16/E4	020-030	DEB	5.3		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S35/W.5	020-030	DEB	5.3		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S26/E 17	000-010	DEB	5.6		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	510.5/E0	000-010	DEB	6.6		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S35/W.5	000-010	DEB	6.7		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S35/W.5	020-030	DEB	6.7		BODIE	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 18.5/W4.55	020-030	BIF	6.0		BS/PP/FM	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 19/E0	050-060	PPT	4.2		GRASSHOPPER	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S26/E 17	020-030	DEB	1.3		MT. HICKS	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S50/E1.5	030-040	PPT	3.3		MT. HICKS	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	521.45/E2.65	010-020	PPT	3.8	3.0	MT. HICKS	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 19/E0	110-120	DEB	6.2		MT. HICKS	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	510.5/E0	010-020	DEB	1.9		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	5 13.5/W4. 1	000-010	PPT	2.5	17.1	NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 19.5/W4.55	000-010	PPT	2.5		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 16/E4	000-010	DEB	2.7		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 19/E0	040-050	DEB	3.0		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	519.5/W3.0	050-060	DEB	3.2		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 19/E0	000-010	DEB	3.3		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 19/E0	010-020	DEB	3.5		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S20/EI	000-010	BIF	3.6		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S16/E4		DEB	3.9		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	519.5/W3.0	040-050	DEB	4.0		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S 16/E4	010-020	DEB	4.6		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat
ELD-851/H	Upland	S19.5/W3.	000-010	BIF	5.0		NAPA	1735	10	686977	4280050	AUBURN	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
GLE-105	Lowland	M13	045-065	BIF	4.7		BODIE	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	0-10	000-030	BIF	5.0		BORAX	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	M13	000-015	DEB	5.1		BORAX	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	0-10	015-030	BIF	5.7		BORAX	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	O14	030-045	BIF	5.7		BORAX	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	O14	000-030	BIF	5.8		BORAX	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	O14	000-015	BIF	6.4		BORAX	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	O14	015-030	DEB	2.3		GRASSHOPPER	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	0-10	030-045	BIF	2.1		NAPA	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	O14	045-065	BIF	1.7		TUSCAN	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	O14	015-030	BIF	2.1		TUSCAN	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	M13	030-045	DEB	2.2		TUSCAN	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	O14	015-030	DEB	2.3		TUSCAN	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	R14	015-030	DEB	2.4		TUSCAN	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	M13	015-030	DEB	2.5		TUSCAN	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	O14	065-075	DEB	3.1		TUSCAN	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	O14	045-065	DEB	3.2		TUSCAN	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	0-10	030-045	DEB	3.2		TUSCAN	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-105	Lowland	O14	065-075	DEB	3.3		TUSCAN	11	10	585846	4391357	TEHAMA	3 Early-Holo
GLE-138	upland	CACHE	000-021	BIF	3.5		BORAX	5060	10	529118	4375417	SHEETIRON	0 pre-Quat
GLE-138	upland	CACHE	000-021	BIF	3.5		BORAX	5060	10	529118	4375417	SHEETIRON	0 pre-Quat
GLE-138	upland	CACHE	000-021	BIF	3.5		BORAX	5060	10	529118	4375417	SHEETIRON	0 pre-Quat
GLE-138	upland	CACHE	000-021	BIF	3.5		BORAX	5060	10	529118	4375417	SHEETIRON	0 pre-Quat
GLE-138	upland	CACHE	000-021	BIF	3.5		BORAX	5060	10	529118	4375417	SHEETIRON	0 pre-Quat
GLE-138	upland	CACHE	000-021	BIF	3.6		BORAX	5060	10	529118	4375417	SHEETIRON	0 pre-Quat
GLE-138	upland	CACHE	000-021	BIF	3.6		BORAX	5060	10	529118	4375417	SHEETIRON	0 pre-Quat
GLE-138	upland	CACHE	000-021	BIF	3.6		BORAX	5060	10	529118	4375417	SHEETIRON	0 pre-Quat
GLE-138	upland	CACHE	000-021	BIF	3.6		BORAX	5060	10	529118	4375417	SHEETIRON	0 pre-Quat
GLE-138	upland	CACHE	000-021	BIF	3.6		BORAX	5060	10	529118	4375417	SHEETIRON	0 pre-Quat
GLE-217	Lowland	2	010-020	DEB	1.6		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	010-020	DEB	2.6		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	020-030	DEB	2.6		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U2	020-030	DEB	2.6		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	030-040	DEB	2.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	3.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	3.0		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	090-100	DEB	3.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	090-100	DEB	3.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	090-100	DEB	3.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	030-040	DEB	3.6	4.5	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	010-020	DEB	3.6		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	020-040	DEB	3.6		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	000-010	DEB	3.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
GLE-217	Lowland	1	040-050	DEB	3.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	050-060	DEB	3.9	4.2	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	050-060	DEB	3.9	5.1	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	040-050	DEB	3.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	020-030	DEB	4.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	050-060	DEB	4.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	040-050	DEB	4.0	5.0	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	070-080	DEB	4.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	050-060	DEB	4.0		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	020-030	DEB	4.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	030-040	DEB	4.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	050-060	DEB	4.2	4.9	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	4.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	040-050	DEB	4.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	010-020	DEB	4.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	040-050	DEB	4.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U7	040-050	DEB	4.3		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	4.4	7.2	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	010-020	DEB	4.4	13.0	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	4.4	7.2	BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	020-040	DEB	4.4		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	4.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	020-030	DEB	4.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	040-050	DEB	4.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	030-040	DEB	4.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	010-020	DEB	4.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U7	020-030	DEB	4.5		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U7	040-050	DEB	4.5		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	4.6		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	060-070	DEB	4.6	6.5	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	080-090	DEB	4.6		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	030-040	DEB	4.6		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	030-040	DEB	4.7		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	060-070	BIF	4.7		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	060-070	BIF	4.7		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	030-040	DEB	4.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	030-040	DEB	4.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	020-030	DEB	4.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	4.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	050-060	DEB	4.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	050-060	DEB	4.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	090-100	DEB	4.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	020-030	DEB	5.0	5.5	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
GLE-217	Lowland	1	040-050	DEB	5.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	040-050	DEB	5.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	010-020	DEB	5.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	040-050	DEB	5.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	040-050	DEB	5.0		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	040-050	DEB	5.0		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	050-060	DEB	5.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	5.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	5.1		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	050-060	DEB	5.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	030-040	DEB	5.2	12.0	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	060-070	DEB	5.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	030-040	DEB	5.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	020-030	DEB	5.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	080-090	DEB	5.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	5.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U7	020-030	DEB	5.3		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	5.3		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	5	000-010	DEB	5.4		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	060-070	DEB	5.4		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	5.4		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	010-020	DEB	5.4		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	060-070	DEB	5.4		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	030-040	DEB	5.4		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	030-040	DEB	5.4		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	000-020	DEB	5.4		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	5.4		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	030-040	DEB	5.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	030-040	DEB	5.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	020-030	DEB	5.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	020-030	DEB	5.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	030-040	DEB	5.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	060-070	DEB	5.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	5.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	010-020	DEB	5.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	070-080	DEB	5.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	040-050	DEB	5.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U2	030-040	DEB	5.5		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	5.5		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	010-020	DEB	5.6	6.6	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	030-040	DEB	5.6		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	010-020	DEB	5.6	10.0	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	010-020	DEB	5.6		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
GLE-217	Lowland	2	030-040	DEB	5.6		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	010-020	DEB	5.7		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	010-020	DEB	5.7		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	050-060	DEB	5.7		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	030-040	DEB	5.7		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	060-070	DEB	5.7		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	020-030	DEB	5.7		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	040-050	DEB	5.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	000-010	DEB	5.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	030-040	DEB	5.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	5.8	18.5	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	060-080	DEB	5.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	020-030	DEB	5.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	020-030	DEB	5.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	000-020	DEB	5.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	5.8	18.5	BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	030-040	DEB	5.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	000-010	DEB	5.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	040-050	DEB	5.9	7.5	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	010-020	DEB	5.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	010-020	DEB	5.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	040-050	DEB	5.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	070-080	DEB	5.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U2	030-040	DEB	5.9		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	040-050	DEB	5.9	7.5	BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	SURFACE	SURFACE	BIF	6.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	050-060	DEB	6.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	040-060	DEB	6.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	SURFACE	SURFACE	BIF	6.0		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	000-010	DEB	6.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	6.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	040-050	DEB	6.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	070-080	DEB	6.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	000-010	DEB	6.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	030-040	DEB	6.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	060-070	DEB	6.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	020-030	DEB	6.1		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	6.1		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	040-050	DEB	6.1		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	070-080	DEB	6.1		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	000-010	DEB	6.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	080-090	DEB	6.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	090-100	DEB	6.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
GLE-217	Lowland	4	000-010	DEB	6.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	000-010	DEB	6.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	010-020	DEB	6.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	000-020	DEB	6.2	6.8	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	040-060	DEB	6.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	040-060	DEB	6.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	5	020-030	DEB	6.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	050-060	DEB	6.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	050-060	DEB	6.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	000-010	DEB	6.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	010-020	DEB	6.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	030-040	PPT	6.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	6	040-060	BIF	6.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	6.4		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	000-010	DEB	6.7		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U2	000-010	DEB	6.7		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	6.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	6.8		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	000-010	DEB	6.9		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	010-020	DEB	7.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	000-010	DEB	7.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	010-020	DEB	7.2		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U2	000-010	DEB	7.2		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	050-060	DEB	7.3		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	050-060	DEB	7.3		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	7.4		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	7.4		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	000-010	DEB	7.5		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	010-020	DEB	7.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U2	010-020	DEB	7.8		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	010-020	DEB	8.1	8.8	BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	5	010-020	DEB	9.8		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	11.0		BORAX	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	11.0		BORAX	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	020-030	DEB	3.3		BUCK MT.	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U2	020-030	DEB	3.3		BUCK MT.	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	060-070	DEB	2.6		GRASSHOPPER	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U1	060-070	DEB	2.6		GRASSHOPPER	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	040-050	BIF	4.1		GRASSHOPPER	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	040-050	BIF	4.1		GRASSHOPPER	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	010-020	PPT	4.4		GRASSHOPPER	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U3	010-020	PPT	4.4		GRASSHOPPER	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	080-090	DEB	5.1		GRASSHOPPER	222	10	540329	4384750	TEHAMA	3 Early-Holo

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
GLE-217	Lowland	U7	080-090	DEB	5.1		GRASSHOPPER	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	1.0		MT. KONOCTI	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U1	000-010	DEB	1.0		MT. KONOCTI	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	3	010-020	DEB	1.5	2.5	MT. KONOCTI	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U3	010-020	DEB	1.5	2.5	MT. KONOCTI	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	020-030	DEB	2.6		MT. KONOCTI	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U1	020-030	DEB	2.6		MT. KONOCTI	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	000-010	DEB	3.9		MT. KONOCTI	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U7	000-010	DEB	3.9		MT. KONOCTI	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	000-010	DEB	4.6		MT. KONOCTI	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	000-010	DEB	4.9		MT. KONOCTI	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	7	000-010	DEB	5.3		MT. KONOCTI	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U7	000-010	DEB	5.3		MT. KONOCTI	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	1	000-010	DEB	5.6		MT. KONOCTI	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	U1	000-010	DEB	5.6		MT. KONOCTI	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	000-010	DEB	6.2		MT. KONOCTI	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	4	000-010	DEB	6.2		MT. KONOCTI	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	070-080	DEB	4.0		NAPA	222	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-217	Lowland	2	070-080	DEB	4.0		NAPA	222.5	10	540329	4384750	TEHAMA	3 Early-Holo
GLE-268	upland	UNIT 8	000-010	CORE	0.9		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 8	010-020	DEB	2.0		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	SURFACE	SURFACE	BIF	3.0		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 9	050-060	DEB	3.5		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 9	000-010	DEB	3.6		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 6	060-070	DEB	3.8		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 10	040-050	DEB	4.1		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 6	050-060	DEB	4.1		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	SURFACE	SURFACE	DEB	4.3		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	AUGER 9	000-023	BIF	4.4	2.1	BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	SURFACE	SURFACE	DEB	4.4		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 10	020-030	DEB	4.4		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	SURFACE	SURFACE	DEB	4.7		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 10	040-050	DEB	4.9		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 9	060-070		7.2	5.2	BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 12	010-020	DEB	8.7		BORAX	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 10	050-060	DEB	1.9	2.6	MEDICINE LAKE	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 10	050-060	DEB	2.6		MEDICINE LAKE	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 8	030-040	DEB	3.0		MEDICINE LAKE	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 12	010-020	DEB	4.3		MEDICINE LAKE	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 10	030-040	DEB	2.7		MT. KONOCTI	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 2	020-030	DEB	3.5		MT. KONOCTI	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 6	050-060	DEB	3.8		MT. KONOCTI	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
GLE-268	upland	UNIT 11	000-010	DEB	2.0		N/A	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
GLE-268	upland	UNIT 6	040-050	DEB	4.3		NAPA	900	10	540484	4374895	LODO-TEHAMA	0 pre-Quat
NEV-009	Upland	STU 3	040-060	DEB	2.0		MT. HICKS	5800	10	740681	4356062	EUER-MARTIS	1 EP-LP
NEV-009	Upland	STU 3	040-060	DEB	2.2		MT. HICKS	5800	10	740681	4356062	EUER-MARTIS	1 EP-LP
NEV-009	Upland	STU 3	040-060	DEB	3.0		MT. HICKS	5800	10	740681	4356062	EUER-MARTIS	1 EP-LP
NEV-009	Upland	STU 3	040-060	DEB	3.0		MT. HICKS	5800	10	740681	4356062	EUER-MARTIS	1 EP-LP
NEV-009	Upland	STU 3	020-040	DEB	3.1		MT. HICKS	5800	10	740681	4356062	EUER-MARTIS	1 EP-LP
NEV-009	Upland	STU 3	020-040	DEB	3.1		MT. HICKS	5800	10	740681	4356062	EUER-MARTIS	1 EP-LP
NEV-009	Upland	STU 3	060-080	DEB	3.1		MT. HICKS	5800	10	740681	4356062	EUER-MARTIS	1 EP-LP
NEV-009	Upland	STU 3	020-040	DEB	4.0		MT. HICKS	5800	10	740681	4356062	EUER-MARTIS	1 EP-LP
NEV-009	Upland	STU 10	020-040	PPT	6.2		SUTRO	5800	10	740681	4356062	EUER-MARTIS	1 EP-LP
NEV-013/H	Upland		020-030	FTL	2.1		ANNADEL	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		020-030	PPT	1.8		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		040-050	DEB	2.2		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		010-020	DEB	2.3		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		000-010	DEB	2.4		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		000-010	DEB	3.3		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		000-010	DEB	3.5		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		010-020	DEB	4.2		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		010-020	DEB	4.2		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		030-040	DEB	4.2		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		030-040	DEB	4.2		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		010-020	DEB	4.5		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		050-060	DEB	5.1		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		010-020	DEB	5.7		BODIE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		030-040	DEB	2.8		BORAX	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		010-020	DEB	1.7		CASA D	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		000-010	DEB	2.8		CASA D	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		000-010	DEB	5.7		CASA D	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		020-030	DEB	5.7		MEDICINE LAKE	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		020-030	DEB	3.9		MT. HICKS	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		000-010	DEB	2.7		NAPA	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		030-040	DEB	3.2		NAPA	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		020-030	DEB	3.9		NAPA	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		030-040	DEB	4.3		NAPA	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		000-010	DEB	5.1		NAPA	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-013/H	Upland		010-020	DEB	2.1		SUTRO	5900	10	738251	4356219	CELIO-GEFO-AQUOLLS	5 late-Holo
NEV-015	Upland	22 SE 20	030-061		3.5		BORAX			0	0	CHAIX-HOTAW	0 pre-Quat
NEV-015	Upland	16 SW 20	030-061		4.4		BORAX			0	0	CHAIX-HOTAW	0 pre-Quat
NEV-015	Upland	16 SW 20	030-061		4.1		CASA D			0	0	CHAIX-HOTAW	0 pre-Quat
NEV-015	Upland		030-061		2.3		NAPA			0	0	CHAIX-HOTAW	0 pre-Quat
NEV-021	Upland	N485/E580	010-020	DEB	2.0		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	010-020	DEB	2.0		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N500/E589	000-010	DEB	2.6		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
NEV-021	Upland	N502/E580	020-030	DEB	2.7		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	030-040	DEB	2.7		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	010-020	BIF	3.0		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N500/E600	010-020	DEB	3.4		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N500/E522	060-070	DEB	3.9		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N500/E589	020-030	DEB	3.9		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	040-050	DEB	3.9		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	010-020	DEB	4.0		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	010-020	DEB	4.1		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	000-010	DEB	4.2		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	030-040	DEB	4.3		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N500/E589	010-020	DEB	4.5		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N481/E567	000-010	DEB	5.7		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N500/E589	000-010	DEB	5.8		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N504/E581	000-010	DEB	7.0		BODIE	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N504/E581	010-020	DEB	1.7		BUFFALO HILLS	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	040-050	DEB	2.0		BUFFALO HILLS	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	040-050	DEB	2.0		BUFFALO HILLS	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	000-010	DEB	2.5		BUFFALO HILLS	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N504/E581	000-010	DEB	2.7		BUFFALO HILLS	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	010-020	DEB	2.8		BUFFALO HILLS	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	000-010	DEB	3.3		BUFFALO HILLS	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N502/E580	000-010	DEB	3.5		BUFFALO HILLS	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N500/E589	000-010	DEB	3.6		CASA D	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N500/E560	010-020	DEB	2.1		DAVIS CREEK	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	227° 13M FROM N500/E540	SURFACE	BIF	3.9		GRASSHOPPER	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N500/E522	000-010	DEB	5.0		GRASSHOPPER	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N479/E612	020-030	DEB	5.1		HART MOUNTAIN	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N500/E560	000-010	DEB	1.3		MT. HICKS	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N479/E612	000-010	DEB	4.1		N/A	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N500/E600	000-010	DEB	1.4		NAPA	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-021	Upland	N481/E567	010-020	DEB	4.1		NAPA	5500	10	744138	4359629	MARTIS-EUER	1 EP-LP
NEV-194	Upland	4	000-010	DEB	1.3		BODIE	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	10	010-020	DEB	2.3		BODIE	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	11	010-020	DEB	2.5		BODIE	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	4	030-040	DEB	4.0		BORAX	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	3	020-030	DEB	2.7		Massacre Lake/Guano Valley	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	10	030-040	DEB	2.7		Massacre Lake/Guano Valley	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	5	000-010	DEB	3.1		Massacre Lake/Guano Valley	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	4	010-020	DEB	3.5		Massacre Lake/Guano Valley	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	4	000-010	DEB	1.8		NAPA	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	4	040-050	DEB	2.6		NAPA	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	1	000-010	DEB	3.0		NAPA	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
NEV-194	Upland	7	010-020	DEB	3.2		NAPA	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	12	020-030	DEB	3.2		NAPA	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	5	000-010	DEB	4.2		NAPA	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-194	Upland	7	010-020	DEB	4.2		NAPA	1800	10	660847	4341537	BOOMER-ROCK OUTCROP	0 pre-Quat
NEV-199	Upland	S7/W6	060-080	DEB	1.8		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/W5	030-040	PPT	1.8		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S6/W19	040-060	DEB	1.8		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S7/W0	020-040	DEB	2.6		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/W2	060-080	PPT	2.7		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/W10	000-020	PPT	2.8		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S11/E2	060-070	DEB	3.6		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S8/W29	020-040	PPT	3.7		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/E14	020-040	DEB	4.2		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S7/W26	000-020	DEB	4.2		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S11/E18	060-080	DEB	4.7		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/E16	020-040	DEB	5.3		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/W2	040-060	PPT	6.6		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/E15	040-060	DEB	6.7		BODIE	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/E2	040-050	DEB	1.8		CASA D	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/W7	000-020	PPT	2.3		CASA D	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/W10	010-020	PPT	2.5		CASA D	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S11/E19	040-060	PPT	4.6		CASA D	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S7/W10	040-060	PPT	1.5		Massacre Lake/Guano Valley	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/E2	040-060	DEB	2.4	2.7	Massacre Lake/Guano Valley	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S7/W4	020-040	DEB	2.4		Massacre Lake/Guano Valley	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S11/E0	060-080	DEB	3.2		Massacre Lake/Guano Valley	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S13/E27	030-040	DEB	3.9		Massacre Lake/Guano Valley	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/W2	010-020	PPT	3.9		Massacre Lake/Guano Valley	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S5/W10	060-080	DEB	4.0		Massacre Lake/Guano Valley	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	SURFACE		PPT	6.3		Massacre Lake/Guano Valley	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/E62	020-030	PPT	2.0		MT. HICKS	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S11/E0	040-060	PPT	2.1		MT. HICKS	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S15/E32	050-060	DEB	2.6		MT. HICKS	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S7/W3	000-010	PPT	1.7		N/A	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/W7	020-040	DEB	2.0		N/A	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/E16	000-020	PPT	3.1		N/A	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S11/E3	000-020	PPT	4.3		N/A	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	S9/E16	040-060	PPT	4.3		N/A	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-199	Upland	N1/W21	000-010	PPT	1.4		TRUCKEE MEADOWS	5900	10	739745	4356415	EUER-MARTIS	1 EP-LP
NEV-203	Upland	U1	070-080	DEB	4.2		BODIE	2800	10	672654	4352810	AIKEN	0 pre-Quat
NEV-203	Upland	U2	010-020	DEB	3.1		BORAX	2800	10	672654	4352810	AIKEN	0 pre-Quat
NEV-203	Upland	U1	000-010	FFT	3.8		BORAX	2800	10	672654	4352810	AIKEN	0 pre-Quat
NEV-203	Upland	U1	070-080	DEB	4.3		BORAX	2800	10	672654	4352810	AIKEN	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
NEV-203	Upland	U2	010-020	DEB	2.9		NAPA	2800	10	672654	4352810	AIKEN	0 pre-Quat
NEV-203	Upland	U1	070-080	DEB	3.2		NAPA	2800	10	672654	4352810	AIKEN	0 pre-Quat
NEV-203	Upland	U2	060-070	DEB	3.4		NAPA	2800	10	672654	4352810	AIKEN	0 pre-Quat
NEV-203	Upland	U1	070-080	DEB	3.5		NAPA	2800	10	672654	4352810	AIKEN	0 pre-Quat
NEV-203	Upland	U1	060-070	FFT	6.5		NAPA	2800	10	672654	4352810	AIKEN	0 pre-Quat
NEV-203	Upland	U2	010-020	DEB	1.8		PINTO PEAK	2800	10	672654	4352810	AIKEN	0 pre-Quat
NEV-203	Upland	U1	000-010	BIF	5.0		PINTO PEAK	2800	10	672654	4352810	AIKEN	0 pre-Quat
NEV-203	Upland	U1	060-070	PPT	3.5	5.8	SOUTH WARNER	2800	10	672654	4352810	AIKEN	0 pre-Quat
NEV-251	Upland	U2	090-100	DEB	4.4		BODIE	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	060-070	DEB	3.7		BORAX	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	060-070	DEB	5.6		BORAX	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	090-100	DEB	9.5		BORAX	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	000-010	DEB	5.4		BORDWELL SPRING	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	070-080	PPT	3.4	5.6	MT. HICKS	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	020-030	DEB	1.8		NAPA	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	090-100	DEB	2.4		NAPA	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	090-100	BIF	2.4		NAPA	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	010-020	DEB	3.0		NAPA	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	090-100	DEB	3.2		NAPA	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	010-020	DEB	3.2		NAPA	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	120-130	PPT	4.6		NAPA	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	110-120	DEB	4.9		NAPA	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	010-020	DEB	7.7		NAPA	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	070-080	PPT	5.0		SOUTH WARNER	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-251	Upland	U2	070-080	PPT	3.7		SUTRO	3140	10	675904	4359645	HORSESHOE	0 pre-Quat
NEV-318	Upland		010-020	BIF	2.7		DOMINGO HILLS	4080	10	686175	4346275	CROZIER-MCCARTHY	0 pre-Quat
NEV-407	Upland	UNIT 47	010-020	DEB	1.2		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 54	060-070	DEB	2.0		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 21	010-020	DEB	2.1		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	050-060	BIF	2.5		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	090-100	BIF	2.9		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	150-160	DEB	3.4		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 25	050-060	DEB	3.8		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 5	060-070	DEB	4.0		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	160-170	DEB	4.0		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 50	060-070	DEB	4.3		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	52	080-090	BIF	4.4		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 48	030-040	DEB	4.4		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	30	070-080	BIF	4.6		BODIE	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	070-080	BIF	1.0		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	38	010-020	PPT	1.1		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	180-190	DEB	2.0		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	45	000-010	DEB	2.1		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
NEV-407	Upland	UNIT 18	010-020	DEB	2.1		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	42	030-040	PPT	2.4		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	41	040-050	BIF	2.6		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	140-150	DEB	2.6		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	080-090	BIF	2.7		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	50	070-080	BIF	3.2		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	42	040-050	PPT	3.5		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	51	010-020	DEB	3.5		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	200-210	DEB	3.7		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 53	100-110	DEB	3.9		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 54	040-050	DEB	4.2		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 41	070-080	DEB	4.3		BORAX	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 23	010-020	DEB	2.0		COSO	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 58	000-010	DEB	3.3		COSO	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 47	080-090	DEB	4.1		COSO	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 53	100-110	DEB	4.1		COSO	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 53	080-100	DEB	2.6		Massacre Lake/Guano Valley	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	25	010-020	BIF	2.7		Massacre Lake/Guano Valley	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 46	030-040	BIF	3.3		Massacre Lake/Guano Valley	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 37	030-035	DEB	3.9		Massacre Lake/Guano Valley	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	110-120	BIF	5.7		Massacre Lake/Guano Valley	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	46	020-030	PPT	7.1		Massacre Lake/Guano Valley	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 16	050-060	BIF	3.4		MT. HICKS	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 24	020-030	DEB	1.5		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 6	060-070	DEB	1.7		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 25	030-040	DEB	1.8		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 47	050-060	DEB	2.2		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 53	080-090	DEB	2.2		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 51	020-030	DEB	2.7		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	43	090-100	DEB	2.9		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	120-130	DEB	3.2		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 30	040-050	DEB	3.6		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 45	140-150	DEB	4.0		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 52	090-100	DEB	4.1		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 43	050-060	DEB	5.5		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-407	Upland	UNIT 41	020-030	DEB	7.0		NAPA	2400	10	664985	4341897	SITES	0 pre-Quat
NEV-569/H	Upland	Feature 4		DEB	1.9		BODIE	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W36		DEB	2.6		BODIE	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N21/W44		DEB	3.2		BODIE	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N21/W44		DEB	3.2		BODIE	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	Feature 4		DEB	3.5		BODIE	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	Feature 4		DEB	4.0		BODIE	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	0.8		BUFFALO HILLS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
NEV-569/H	Upland	N21/W44		BIF	1.2		BUFFALO HILLS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	1.2		BUFFALO HILLS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	Feature 4		DEB	1.2		BUFFALO HILLS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	Feature 4		DEB	1.3		BUFFALO HILLS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	Feature 4		DEB	1.3		BUFFALO HILLS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W36		DEB	2.8		BUFFALO HILLS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N21/W44		DEB	2.5		MEDICINE LAKE	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	3.5		MEDICINE LAKE	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N97/W1		DEB	3.8		MEDICINE LAKE	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	Feature 4		DEB	1.1		MT. HICKS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	1.4		MT. HICKS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	1.7		MT. HICKS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	1.7		MT. HICKS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	2.5		MT. HICKS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N21/W44		DEB	2.9		MT. HICKS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	3.0		MT. HICKS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	3.0		MT. HICKS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	3.4		MT. HICKS	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	Feature 4		DEB	1.2		N/A	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	Feature 4		DEB	1.3		N/A	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	1.1		NAPA	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	2.2		NAPA	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W36		DEB	2.8		NAPA	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	2.2		NW NEVADA	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	Feature 4		DEB	1.1		SOUTH WARNER	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	1.1		SUTRO	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W35		DEB	1.7		SUTRO	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W36		DEB	1.9		SUTRO	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N21/W44		DEB	2.2		SUTRO	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N21/W44		PPT	2.4		SUTRO	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-569/H	Upland	N39/W36		DEB	5.5		SUTRO	5640	10	750508	4364411	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland		SURFACE	DEB	0.8		BODIE	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland		SURFACE	DEB	1.0		BODIE	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	N27/E48	000-010	DEB	1.3		BODIE	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	N27/E48	030-040	DEB	1.7		BODIE	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	S28/E49	000-010	DEB	1.2		GRASSHOPPER	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	S29/E55	000-010	DEB	3.5		GRASSHOPPER	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	N27/E48	000-010	DEB	4.5		Massacre Lake/Guano Valley	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	N27/E48	000-010	DEB	5.0		Massacre Lake/Guano Valley	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland		SURFACE	DEB	6.0		Massacre Lake/Guano Valley	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	N27/E48	000-010	DEB	1.1		N/A	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	S28/E49	000-010	DEB	1.3		N/A	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	S28/E49	020-030	DEB	1.3		N/A	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
NEV-575/H	Upland	N27/E48	000-010	DEB	1.7		N/A	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	N27/E48	020-030	DEB	2.0		N/A	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	N27/E48	000-010	DEB	6.0		N/A	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland	S29/E55	000-010	DEB	3.5		SUTRO	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-575/H	Upland		SURFACE	DEB	3.5		SUTRO	5800	10	751745	4364676	ALDI VARIANT-MARTIS	1 EP-LP
NEV-876	Upland	54° 57M FROM DATUM	SURFACE	BIF	3.2		SUTRO	6000	10	744275	4359466	MARTIS-EUER	1 EP-LP
NEV-884	Upland	N26/W49	000-010	DEB	2.2		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	3.3		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	3.4		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N1/E1	010-020	DEB	4.1		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	4.2		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N1/E1	020-030	DEB	4.3		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N1/E1	020-030	DEB	4.7		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	744367E/4359951N	SURFACE	DEB	5.0		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	5.0		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N1/E1	010-020	DEB	5.1		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	6.5		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	6.7		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N1/E1	010-020	DEB	7.3		BODIE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N26/W49	000-010	BIF	3.5		BUCK MT.	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	1.3		BUFFALO HILLS	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N1/E1	090-100	DEB	2.1		BUFFALO HILLS	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	3.0		CASA D	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	3.6		CASA D	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	5.3		CASA D	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	1; 119° 6.5M FROM DATUM	000-010	DEB	3.5		DAVIS CREEK	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	3.2		MT. HICKS	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	3.0		N/A	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	3.4		N/A	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N0/E0	000-010	DEB	4.3		PINE GROVE	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
NEV-884	Upland	N1/E1	080-090	DEB	4.0		QUEEN	6000	10	743584	4359919	KYBURZ-ROCK OUTCROP	0 pre-Quat
PL-1	Upland	CU-2	000-010	DEB	4.9		BODIE	127	10	647764	4301125	ALAMO-FIDDYMENT	1 EP-LP
PL-1	Upland	CU-2	000-010	DEB	6.8		BODIE	127	10	647764	4301125	ALAMO-FIDDYMENT	1 EP-LP
PL-1	Upland	CU-4	000-010	DEB	3.5		CB Concrete	127	10	647764	4301125	ALAMO-FIDDYMENT	1 EP-LP
PL-1	Upland	CU-2	010-020	DEB	3.0		SUTRO	127	10	647764	4301125	ALAMO-FIDDYMENT	1 EP-LP
PL-4	Upland	CU-3	020-030	DEB	4.3		BORAX	235	10	651044	4300835	EXCHEQUER-ROCK OUTCROP	0 pre-Quat
PL-4	Upland	CU-3	010-020	BIF	4.6		N/A	235	10	651044	4300835	EXCHEQUER-ROCK OUTCROP	0 pre-Quat
PLA-005	Upland	K14	Level 1	DEB	1.4		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	M6	Level 2	DEB	1.4		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X18	Level 1	Preform	1.4		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	K16	Level 3	DEB	1.5		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			Preform	1.6		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	GG2	Level 2	DEB	1.6		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-005	Upland	K17	Level 3	DEB	1.6		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F2	Level 1	DEB	1.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	C3	Level 1	DEB	1.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F4	Level 3	DEB	1.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	K3	Level 1	Preform	1.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	K2	Level 1	DEB	1.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A3	Level 1	DEB	1.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A2	Level 1	DEB	1.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	R3	Level 1	DEB	1.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A3	Level 5	DEB	1.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F1	Level 1	DEB	1.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			PPT	1.9		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	Z9	Level 1	DEB	1.9		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	G1	Level 1	BIF	1.9		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	M1	Level 2	DEB	1.9		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F1	Level 3	DEB	2.0		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	K17	Level 4	DEB	2.0		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F2	Level 2	DEB	2.1		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F2	Level 3	DEB	2.1		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X16	Level 2	PPT	2.2		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			DEB	2.3		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F2	Level 1	DEB	2.3		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	K16	Level 2	DEB	2.3		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A3	Level 1	DEB	2.4		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	K12	Level 1	DEB	2.4		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	W10	Level 1	DEB	2.4		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	Z11	Level 1	DEB	2.5		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			DEB	2.6		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	HH3	Level 2	DEB	2.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A1	Level 1	DEB	2.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	K11	Level 1	DEB	2.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	M2	Level 1	DEB	2.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A1	Level 2	DEB	2.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	C3	Level 4	DEB	2.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X14	Level 1	DEB	2.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	M6	Level 1	DEB	2.9		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F1	Level 4	DEB	3.0		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F2	Level 4	DEB	3.0		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	V6	Level 1	DEB	3.1		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			DEB	3.2		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	K5	Level 1	DEB	3.2		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A3	Level 2	DEB	3.2		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F4	Level 4	DEB	3.2		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-005	Upland	I6	Level 2	DEB	3.2		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	K1	Level 1	DEB	3.3		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	R1	Level 2	DEB	3.4		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F1	Level 2	DEB	3.4		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	HH6	Level 1	DEB	3.5		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A1	Level 7	DEB	3.5		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	HH5	Level 1	DEB	3.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A4	Level 5	DEB	3.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			PPT	3.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			DEB	3.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			PPT	3.9		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	Z5	Level 1	DEB	3.9		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	I5	Level 1	DEB	3.9		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	T2A	Level 3	DEB	4.1		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X1	Level 1	PPT	4.1		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	D3	Level 1	PPT	4.2		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	I3	Level 1	DEB	4.3		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	EE2	Level 2	DEB	4.5		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	T2B	Level 1	DEB	4.8		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			DEB	4.9		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	I1	Level 2	DEB	5.5		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	HH2	Level 1	DEB	5.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	W6	Level 1	DEB	5.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	I4	Level 1	DEB	5.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	EE2	Level 1	DEB	6.7		BODIE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A1	Level 3	DEB	2.5		BORAX	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			BIF	2.4		BS/PP/FM	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			PPT	3.9		CB Concrete	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	T3B	Level 1	DEB	4.7		CB Concrete	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	W3	Level 1	PPT	2.9		MEDICINE LAKE	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	J4	Level 1	DEB	1.4		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	J10	Level 2	DEB	1.8		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	J4	Level 1	DEB	1.9		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F3	Level 3	PPT	1.9		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	J9	Level 1	DEB	2.0		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X12	Level 1	DEB	2.0		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	J10	Level 1	DEB	2.1		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	G28	Level 1	DEB	2.2		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	V9	Level 1	DEB	2.2		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X15	Level 1	DEB	2.4		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	Z12	Level 1	DEB	2.5		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A1	Level 4	DEB	2.5		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	G3	Level 1	DEB	2.6		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-005	Upland	J3	Level 1	DEB	2.8		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A2	Level 1	DEB	2.8		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	V5	Level 1	DEB	2.9		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	V8	Level 2	DEB	3.0		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	J10	Level 3	DEB	3.0		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	G18	Level 1	DEB	3.1		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	CC2	Level 2	DEB	3.2		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	R2	Level 2	DEB	3.3		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	G21	Level 1	DEB	3.4		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	Q3	Level 1	PPT	3.5		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	I3	Level 2	DEB	3.6		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	GG2	Level 4	DEB	3.7		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	J10	Level 4	DEB	3.7		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	W11	Level 1	DEB	3.9		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	K17	Level 1	PPT	3.9		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	M6	Level 2	DEB	4.1		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	G13	Level 1	DEB	4.3		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	GG2	Level 6	DEB	4.3		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	T2B	Level 2	DEB	4.5		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	CC4	Level 1	DEB	4.6		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	Z8	Level 3	PPT	4.8		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	GG2	Level 1	DEB	5.0		MT. HICKS	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	GG2	Level 3	DEB	1.5		N/A	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	Z2	Level 1	DEB	3.3		N/A	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X12	Level 1	BIF	3.3		N/A	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	C3	Level 9	DEB	3.7		N/A	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A1	Level 5	DEB	5.0		N/A	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	T3B	Level 11	DEB	5.3		N/A	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X10	Level 1	PPT	6.1		N/A	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	M3	Level 1	DEB	2.8		NAPA	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F2	Level 5	DEB	3.8		NAPA	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			PPT	5.3		NAPA	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X15	Level 1	DEB	1.5		QUEEN	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X12	Level 4	DEB	1.5		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X13	Level 1	DEB	1.6		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	I6	Level 1	DEB	1.7		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X1	Level 1	DEB	1.9		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X12	Level 1	DEB	2.0		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X11	Level 1	DEB	2.3		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X2	Level 1	DEB	2.4		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X2	Level 2	PPT	2.5		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			DEB	2.6		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	V3	Level 1	DEB	2.6		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-005	Upland	X12	Level 1	PPT	2.6		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X9	Level 1	DEB	2.8		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X8	Level 1	PPT	2.8		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	F3	Level 3	PPT	3.0		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X12	Level 3	DEB	3.0		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X13	Level 1	DEB	3.0		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X12	Level 1	PPT	3.1		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			DEB	3.2		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X5	Level 1	DEB	3.4		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland			DEB	3.5		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	X15	Level 1	DEB	3.5		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	HH1	Level 1	DEB	3.7		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	W12	Level 1	DEB	3.8		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-005	Upland	A3	Level 3	DEB	4.8		SUTRO	5840	10	747529	4354172	MARTIS-EUER	1 EP-LP
PLA-006	Upland	C2	Level 5	DEB	1.7		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 5	DEB	1.7		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N1	Level 1	DEB	1.8		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 5	DEB	1.8		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 1	DEB	2.2		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	F2	Level 3	PPT	2.2		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C4	Level 6	Preform	2.7		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 5	DEB	3.3		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N3	Level 4	DEB	3.3		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 3	DEB	3.5		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	A2	Level 1	DEB	3.8		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C4	Level 4	DEB	3.9		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 3	DEB	4.1		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 3	DEB	4.1		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	A2	Level 2	DEB	4.1		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C3	Level 1	BIF	4.1		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C4	Level 5	PPT	4.3		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 1	DEB	4.4		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	I2	Level 1	DEB	4.6		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland			PPT	4.8		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	A2	Level 2	DEB	5.3		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 6	DEB	5.4		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N2	Level 1	DEB	5.5		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N2	Level 1	DEB	8.7		BODIE	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 6	DEB	1.5		BS/PP/FM	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	A1	Level 1	DEB	2.1		BS/PP/FM	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 4	DEB	4.6		BS/PP/FM	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 1	DEB	4.8		BS/PP/FM	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 5	DEB	5.2		BS/PP/FM	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-006	Upland	N3	Level 8	DEB	1.8		CB Concrete	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C4	Level 3	DEB	4.4		CB Concrete	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	A2	Level 1	DEB	2.0		Chalk Springs	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C4	Level 4	PPT	2.0		Chalk Springs	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 2	DEB	2.4		Chalk Springs	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C4	Level 4	DEB	1.5		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 3	DEB	1.6		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 5	DEB	1.6		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 2	DEB	2.1		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	B2	Level 1	DEB	2.4		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N3	Level 7	DEB	2.7		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N3	Level 7	DEB	2.8		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 1	DEB	3.0		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N3	Level 3	DEB	3.0		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N3	Level 5	DEB	3.3		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N3	Level 1	DEB	3.6		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C1	Level 4	DEB	3.6		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C4	Level 7	DEB	3.6		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C3	Level 5	DEB	3.8		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N2	Level 1	DEB	4.1		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 1	DEB	4.2		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	A2	Level 4	DEB	4.2		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 3	DEB	4.3		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C4	Level 5	DEB	4.5		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	F2	Level 1	DEB	4.9		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C4	Level 4	PPT	5.0		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland			BIF	5.3		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 5	DEB	5.4		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	A1	Level 1	DEB	6.1		MT. HICKS	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 4	DEB	1.5		N/A	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 3	DEB	1.5		N/A	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 4	DEB	1.6		N/A	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 1	DEB	1.8		N/A	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	D1	Level 4	PPT	1.8		N/A	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 2	DEB	2.2		N/A	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 1	DEB	3.1		N/A	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 3	DEB	4.4		N/A	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 2	DEB	4.5		N/A	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	A2	Level 4	PPT	4.3		NAPA	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 1	DEB	1.1		SUTRO	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N3	Level 2	DEB	1.6		SUTRO	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	B1	Level 5	PPT	1.9		SUTRO	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 3	DEB	2.3		SUTRO	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-006	Upland	A2	Level 7	DEB	2.5		SUTRO	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	N3	Level 3	DEB	3.6		SUTRO	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	A2	Level 4	DEB	3.9		SUTRO	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C2	Level 3	DEB	4.0		SUTRO	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	C4	Level 5	DEB	4.0		SUTRO	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	Q1	Level 2	PPT	4.3		SUTRO	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-006	Upland	A2	Level 3	DEB	4.4		SUTRO	5840	10	748468	4354052	KYBURZ-TROJAN	0 pre-Quat
PLA-163	Upland			DEB	1.9		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	2.4		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	2.4		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.5		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	2.8		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.8		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	2.9		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			PPT	3.0		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.0		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	3.2		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.2		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.2		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	3.3		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	3.4		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	3.5		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	3.5		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	3.5		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.7		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	4.0		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	4.1		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	4.1		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			PPT	4.3		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	4.5		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			FT	4.6		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	5.2		BODIE	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.2		MT. HICKS	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.2		MT. HICKS	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	3.3		MT. HICKS	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	3.5		MT. HICKS	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		MT. HICKS	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.6		MT. HICKS	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.6		MT. HICKS	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	1.4		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	1.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	1.8		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.1		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-163	Upland			DEB	2.2		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.6		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.6		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.8		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.8		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.8		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	2.9		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.0		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.0		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.0		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.0		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.2		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.2		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.4		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.4		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.4		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.4		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.4		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.4		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.4		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.5		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.6		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.6		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.6		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.6		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.6		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.6		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.6		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.7		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.9		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	3.9		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	4.1		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	4.1		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	4.1		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	4.1		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	4.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	4.3		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	4.6		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			DEB	4.6		N/A	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			PPT	3.4		NAPA	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	3.0		SUTRO	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-163	Upland			BIF	5.1		SUTRO	6000	10	741695	4343565	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	1.3		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	1.3		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	1.4		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	1.7		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	1.7		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	1.8		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-164	Upland			DEB	1.8		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	1.9		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			PPT	2.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.3		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.3		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.3		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.3		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.4		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.5		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.6		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.6		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.6		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.6		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.6		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.6		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.6		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.7		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.8		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.8		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	2.8		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			BIF	3.0		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			BIF	3.0		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.0		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.0		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.0		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.0		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.0		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.2		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.3		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.4		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.4		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.4		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.6		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.6		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			BIF	3.7		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-164	Upland			DEB	3.7		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.7		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.7		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.7		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.7		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.7		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.7		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.8		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.8		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.8		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.9		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.9		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	3.9		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.0		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.0		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.2		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.3		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.3		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.3		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.4		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.4		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.4		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.5		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.5		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.6		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	4.6		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	5.1		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	5.2		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	5.2		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-164	Upland			DEB	5.2		N/A	6000	10	741437	4343543	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-165	Upland			DEB	1.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	1.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			PPT	2.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			BIF	2.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	2.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-165	Upland			DEB	3.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			BIF	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			BIF	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			PPT	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			BIF	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			BIF	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			PPT	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-165	Upland			DEB	3.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	3.9		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			BIF	4.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			PPT	4.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			BIF	4.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			BIF	4.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.5		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			BIF	4.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-165	Upland			DEB	4.6		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			BIF	4.7		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			PPT	4.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			BIF	4.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	4.8		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	5.0		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	5.2		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	5.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	5.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	5.3		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	6.1		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-165	Upland			DEB	6.4		N/A	6000	10	741480	4343555	TALLAC	2 latest-Pleist.
PLA-594/H	Upland	CU 10	130-140	DEB	4.5		BODIE	350	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU 9	030-040	BIF	4.8		BODIE	350	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU 9	010-020	BIF	4.9		BODIE	350	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU 7	110-150	DEB	5.8		BS/PP/FM	350	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU 10	110-120	DEB	2.4		NAPA	350	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU 11	120-130	DEB	3.2		NAPA	350	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU 8	120-130	EMF	4.1		NAPA	350	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU 11	100-110	DEB	4.3		NAPA	350	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU 7	060-070	DEB	4.4		NAPA	350	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU-1	020-030	DEB	4.8		NAPA	250	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU 8	010-020	DEB	5.1		NAPA	350	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU 11	150-160	DEB	6.2		NAPA	350	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU-1 EXT.	040-050	DEB	6.2		NAPA	250	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU-3	090-100	BIF	8.1		NAPA	250	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU-1	070-080	DEB	10.1		NAPA	250	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU-3	060-070	DEB	10.3		NAPA	250	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-594/H	Upland	CU-1	010-020	BIF	6.7		SUTRO	250	10	651135	4303762	INKS-EXCHEQUER	0 pre-Quat
PLA-605/H	Upland	CU-1	000-010	DEB	5.7		BODIE	350	10	652724	4300838	ANDREGG	0 pre-Quat
PLA-605/H	Upland	CU-1	070-080	DEB	4.5		BORAX	350	10	652724	4300838	ANDREGG	0 pre-Quat
PLA-605/H	Upland	CU-1	090-100	DEB	5.5		BORAX	350	10	652724	4300838	ANDREGG	0 pre-Quat
PLA-605/H	Upland	CU-1	030-040	DEB	5.8		N/A	350	10	652724	4300838	ANDREGG	0 pre-Quat
PLA-605/H	Upland	CU-4	020-030	DEB	4.7		NAPA	350	10	652724	4300838	ANDREGG	0 pre-Quat
PLA-605/H	Upland	CU-1	000-010	DEB	5.3		NAPA	350	10	652724	4300838	ANDREGG	0 pre-Quat
PLA-605/H	Upland	CU-1	000-010	DEB	5.4		NAPA	350	10	652724	4300838	ANDREGG	0 pre-Quat
PLA-605/H	Upland	CU-1	020-030	DEB	6.2		NAPA	350	10	652724	4300838	ANDREGG	0 pre-Quat
PLA-605/H	Upland	CU-1	000-010	DEB	7.2		NAPA	350	10	652724	4300838	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	130-140	DEB	7.1		BASALT	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	140-150	DEB	4.6		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 10	020-030	DEB	4.7	5.4	BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 16	050-060	DEB	4.8		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-606/H	Upland	CU 9	120-130	DEB	4.9		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 16	050-060	DEB	5.0		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 17	000-010	DEB	5.0		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-4	050-060	DEB	5.1		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 16	030-040	DEB	5.3		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	180-190	DEB	5.6		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	090-100	DEB	5.9		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	150-160	DEB	6.1		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	080-090	DEB	6.2		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	120-130	DEB	6.2		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	120-130	DEB	6.5		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 10	020-030	BIF	7.1		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-5	040-050	BIF	10.1		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	160-170	Blade?	12.3		BODIE	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 13	010-020	DEB	4.1		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	150-160	DEB	4.5		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 17	060-080	DEB	4.5		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 12	050-090	DEB	4.7		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	070-080	DEB	4.8		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 15	020-030	DEB	5.2		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	090-100	DEB	5.3		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-4	060-070	DEB	5.5		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 15	050-070	DEB	5.7		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	SP-13	050-060	DEB	6.2		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	090-100	DEB	6.7		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	130-140	DEB	7.2		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 17	000-010	DEB	7.3		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 13	040-050	DEB	8.1		BORAX	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 11	010-020	DEB	5.8		BS/PP/FM	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	120-130	EMF	6.6		BS/PP/FM	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	000-010	DEB	1.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 16	010-020	DEB	2.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	130-140	DEB	2.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-4	060-070	DEB	2.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 11	030-040	DEB	2.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	030-040	BIF	3.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	040-050	DEB	3.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-4	030-040	DEB	3.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	080-090	DEB	3.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 11	010-020	DEB	3.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	210-220	DEB	3.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 13	020-030	DEB	3.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	180-190	DEB	3.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-606/H	Upland	CU-2	050-060	DEB	3.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 14	030-040	DEB	3.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	180-190	DEB	3.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 14	000-010	DEB	4.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 17	010-020	DEB	4.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 17	040-050	DEB	4.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 12	050-090	DEB	4.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	130-140	DEB	4.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	050-060	DEB	4.2		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 12	050-090	DEB	4.2		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	140-150	DEB	4.2		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	160-170	DEB	4.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	000-010	DEB	4.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 13	000-010	DEB	4.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 14	000-010	DEB	4.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 14	000-010	DEB	4.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 14	030-040	DEB	4.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	140-150	DEB	4.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	160-170	DEB	4.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	100-110	DEB	4.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 12	050-090	DEB	4.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	140-150	DEB	4.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	140-150	DEB	4.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	160-170	DEB	4.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	000-010	DEB	4.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 11	050-060	DEB	4.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	150-160	DEB	4.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	010-020	BIF	4.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	130-140	DEB	4.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	180-190	DEB	4.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	040-050	DEB	4.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	130-140	DEB	4.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	140-150	DEB	4.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	140-150	DEB	4.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	170-180	DEB	4.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	110-120	DEB	4.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	150-160	DEB	4.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	160-170	DEB	4.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	160-170	DEB	4.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	000-010	DEB	5.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	130-140	DEB	5.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	040-050	DEB	5.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	120-130	EMF	5.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-606/H	Upland	CU-2	130-140	DEB	5.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	140-150	DEB	5.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	000-010	DEB	5.2		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	140-150	DEB	5.2		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	140-150	DEB	5.2		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	070-080	DEB	5.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	080-090	DEB	5.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	120-130	DEB	5.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	120-130	DEB	5.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	170-180	DEB	5.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	130-140	DEB	5.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	140-150	DEB	5.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	090-100	DEB	5.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	120-130	BIF	5.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	040-050	DEB	5.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	120-130	DEB	5.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	130-140	EMF	5.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	200-218	DEB	5.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	150-160	DEB	5.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	SP-12	050-060	DEB	5.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	110-120	DEB	5.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	140-150	DEB	5.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	140-150	DEB	5.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	150-160	DEB	5.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	140-150	DEB	5.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	030-040	DEB	5.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	120-130	DEB	5.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	150-160	EMF	5.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	100-110	DEB	5.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	190-220	DEB	5.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	140-150	DEB	5.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	000-010	DEB	5.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	000-010	DEB	5.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	150-160	DEB	5.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	060-070	DEB	5.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 10	040-050	DEB	5.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	010-020	DEB	6.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	150-160	DEB	6.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	000-010	DEB	6.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	100-110	DEB	6.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2 EXT.	120-130	DEB	6.1	5.4	NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	120-130	DEB	6.2		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 10	000-010	DEB	6.2		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-606/H	Upland	CU 8	140-150	DEB	6.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	160-170	DEB	6.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	140-150	DEB	6.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	090-100	DEB	6.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	060-070	DEB	6.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	030-040	DEB	6.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	130-140	DEB	6.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 15	010-020	DEB	6.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	160-170	DEB	6.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-4	040-050	DEB	6.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	080-090	DEB	6.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	150-160	DEB	6.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	170-180	DEB	6.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	210-220	DEB	6.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	160-170	DEB	6.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	040-050	DEB	6.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	130-140	DEB	6.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	090-100	DEB	6.9		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	000-010	DEB	7.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	010-020	DEB	7.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	170-180	DEB	7.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	040-050	DEB	7.0		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 7	000-010	DEB	7.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	120-130	DEB	7.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	130-140	DEB	7.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	200-218	DEB	7.1		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	120-130	DEB	7.2		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	140-150	DEB	7.2		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	140-150	DEB	7.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2 EXT.	150-160	DEB	7.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	170-180	DEB	7.4		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 17	040-050	DEB	7.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	110-120	DEB	7.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	130-140	DEB	7.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	SP-2	020-030	DEB	7.6		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 9	080-090	DEB	7.7		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	110-120	DEB	7.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	080-090	DEB	7.8		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	170-180	DEB	8.4	5.6	NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	100-110	DEB	9.3		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU 8	130-140	DEB	12.2		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-606/H	Upland	CU-2	160-170	DEB	12.5		NAPA	400	10	653000	4300886	ANDREGG	0 pre-Quat
PLA-627/H	Upland	CU2	010-020	DEB	3.9		BODIE	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-627/H	Upland	CU 7	060-070	DEB	4.2		BODIE	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU-3	020-030	DEB	4.4		BODIE	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 7	000-010	DEB	5.3		BODIE	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 7	000-010	DEB	6.6		BODIE	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 9	050-060	BIF	6.6		BODIE	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 7	010-020	DEB	7.0		BODIE	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 7	000-010	DEB	7.3		BODIE	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 9	060-070	EMF	5.9		BORAX	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 7	020-030	DEB	4.2		BS/PP/FM	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 8	030-040	PPT	3.7	6.3	NAPA	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU-2	040-050	DEB	4.6		NAPA	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU2	010-020	DEB	4.7		NAPA	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 6	040-050	DEB	4.9		NAPA	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 6	050-060	BIF	5.0		NAPA	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 6	000-010	DEB	5.3		NAPA	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 7	000-010	DEB	5.3		NAPA	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 7	040-050	DEB	5.6		NAPA	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 9	000-010	DEB	6.0		NAPA	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU 6	030-040	DEB	6.9		NAPA	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-627/H	Upland	CU2	010-020	DEB	6.9		NAPA	275	10	651439	4301341	INKS-EXCHEQUER	0 pre-Quat
PLA-664	Upland	S5/N22	000-010	DEB	2.5		BODIE	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	SURFACE	SURFACE	DEB	1.2		BORAX	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	N1/W10	000-010	DEB	1.9		BORAX	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	S5/N22	020-030	DEB	6.3		BORAX	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	N12/W9	000-010	DEB	1.4		MT. HICKS	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland			DEB	3.2		N/A	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	SURFACE	SURFACE	FFT	1.2		NAPA	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	S5/N22	060-070	DEB	1.2		NAPA	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	SURFACE	SURFACE	DEB	1.4		NAPA	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	S5/N22	030-040	DEB	2.3		NAPA	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	S5/N22	010-020	DEB	2.5		NAPA	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	S5/N22	060-070	DEB	3.2		NAPA	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	S5/N22	010-020	DEB	3.7		NAPA	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	S5/N22	030-040	DEB	1.2		PINE GROVE	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-664	Upland	SURFACE	SURFACE	DEB	1.4		SUTRO	6100	10	718532	4338190	SMOKEY	0 pre-Quat
PLA-682/H	Upland	UNIT 6	000-010	DEB	1.4		BODIE	5200	10	740090	4342647	AQUOLLS AND BOROLLS	5 late-Holo
PLA-682/H	Upland	UNIT 7	020-030	DEB	1.4		BODIE	5200	10	740090	4342647	AQUOLLS AND BOROLLS	5 late-Holo
PLA-682/H	Upland	UNIT 7	030-040	DEB	2.7		BODIE	5200	10	740090	4342647	AQUOLLS AND BOROLLS	5 late-Holo
PLA-682/H	Upland	UNIT 5	050-060	DEB	2.8		BODIE	5200	10	740090	4342647	AQUOLLS AND BOROLLS	5 late-Holo
PLA-682/H	Upland	UNIT 5	070-080	DEB	2.8		BODIE	5200	10	740090	4342647	AQUOLLS AND BOROLLS	5 late-Holo
PLA-682/H	Upland	UNIT 7	020-030	DEB	2.9		BODIE	5200	10	740090	4342647	AQUOLLS AND BOROLLS	5 late-Holo
PLA-682/H	Upland	UNIT 2	030-040	DEB	3.1		BODIE	5200	10	740090	4342647	AQUOLLS AND BOROLLS	5 late-Holo
PLA-682/H	Upland	UNIT 6	060-070	DEB	3.1		BODIE	5200	10	740090	4342647	AQUOLLS AND BOROLLS	5 late-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-682/H	Upland	UNIT 5	070-080	DEB	3.1		BODIE	5200	10	740090	4342647	AQUOLLS AND BOROLLS	5 late-Holo
PLA-682/H	Upland	UNIT 7	050-060	DEB	4.6		BODIE	5200	10	740090	4342647	AQUOLLS AND BOROLLS	5 late-Holo
PLA-682/H	Upland	UNIT 1	010-020	DEB	1.3		MT. HICKS	5200	10	740090	4342647	AQUOLLS AND BOROLLS	5 late-Holo
PLA-689	Upland	Unit 1	000-010	DEB	1.7		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	010-020	PPT	1.7		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	060-070	FT	1.7		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	080-090	FT	1.7		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	010-020	PPT	1.8		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	040-050	PPT	2.5		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	090-100	DEB	3.0		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	070-080	DEB	3.1		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	100+	DEB	4.1		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	020-030	DEB	5.0		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	040-050	PPT	6.2		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	050-060	DEB	6.2		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	SURFACE	SURFACE	FT	6.3		BODIE	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	050-060	BIF	2.4		NAPA	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	080-090	PPT	1.5		SUTRO	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-689	Upland	Unit 1	030-040	PPT	2.4		SUTRO	4100	10	703875	4315602	AIKEN-COHASSET	0 pre-Quat
PLA-695/H	Upland	95-A	020-030		2.1		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95C	050-060		2.1		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95B	030-040		2.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	020-030		2.5		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	000-010		2.9		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	020-030		2.9		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	070-080		3.0		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	070-080		3.0		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95C	040-050		3.0		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95Q	030-040		3.0		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	050-060		3.1		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	050-060		3.2		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95H	070-080		3.2		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95C	030-040		3.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	010-020		3.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	040-050		3.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	060-070		3.4		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95Q	110-120		3.4		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	100-110		3.5		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95Q	130-140		3.5		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	050-060		3.6		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95C	080-090		3.6		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	050-060		3.6		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	060-070		3.8		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-695/H	Upland	95Q	130-140		3.8		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95K	050-060		3.8		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95C	040-050		3.9		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95N	040-050		3.9		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	070-080		4.0		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	110-120		4.0		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95Q	120-130		4.0		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95Q	130-140		4.0		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	120-130		4.1		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95B	020-030		4.1		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95P	030-040		4.1		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	070-080		4.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	090-100		4.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	070-080		4.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95D	000-010		4.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95N	020-030		4.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	050-060		4.4		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	100-110		4.4		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95C	080-090		4.5		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	080-090		4.5		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	060-070		4.5		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	000-010		4.6		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	040-050		4.6		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95O	110-120		4.6		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	040-050		4.7		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	070-080		4.7		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	110-120		4.7		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95B	050-060		4.7		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	020-030		4.7		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95K	000-010		4.7		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95O	160-170		4.7		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	100-110		4.8		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	070-080		4.8		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	080-090		4.8		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	050-060		4.9		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95D	030-040		5.0		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	020-030		5.0		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	030-040		5.2		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95B	040-050		5.2		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95C	060-070		5.2		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95K	000-010		5.2		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	040-050		5.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	030-040		5.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-695/H	Upland	95D	000-010		5.4		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95P	030-040		5.5		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95N	070-080		5.6		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95K	070-080		5.7		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	100-110		5.8		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	040-050		5.9		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	020-030		6.0		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	090-100		6.1		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95N	070-080		6.4		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95D	050-060		6.5		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	100-110		6.7		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95N	020-030		7.1		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95N	050-060		7.3		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95L	020-030		10.6		BODIE	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95H	020-030		1.1		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95Q	000-010		1.2		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95L	000-010		1.7		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	030-040		1.8	1.0	NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95L	020-030		1.9		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95Q	020-030		2.0		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95B	000-010		2.4		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95C	010-020		2.4		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	040-050		2.4		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	040-050		2.8		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	040-050		3.0		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95K	030-040		3.0		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	070-080		3.3		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95L	050-060		3.3		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	020-030		3.4		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95L	040-050		3.5		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95Q	070-080		3.6		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95L	010-020		3.6		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	100-110		3.7		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95D	040-050		3.8		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	050-060		3.8		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95N	050-060		3.9		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	020-030		4.0		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	070-080		4.1		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95C	070-080		4.1		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	060-070		4.1		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	070-080		4.3		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	050-060		4.6		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95L	030-040		4.6		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-695/H	Upland	95-A	040-050		4.7		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	070-080		4.7		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	010-020		4.7		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95B	030-040		4.8		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	050-060		4.8		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	120-130		4.8		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95D	030-040		4.9		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	050-060		5.0		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	020-030		5.1		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95D	030-040		5.2		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95L	000-010		5.3		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95L	020-030		5.3		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95K	020-030		5.4		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95G	060-070		5.7		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95N	090-100		5.7		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95C	030-040		5.8		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-AA	080-090		6.0		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	080-090		6.1		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	060-070		6.6		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95-A	090-100		7.1		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95F	000-010		9.4		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-695/H	Upland	95K	070-080		10.2		NAPA	2200	10	678663	4316957	MARIPOSA	0 pre-Quat
PLA-728/H	Upland	3	040-050	DEB	3.4		ANNADEL	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/B26	080-090	PPT	2.8		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/B30	040-050	DEB	3.0		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	170-180	DEB	3.4		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/E25	060-070	BIF	3.8		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	3	030-040	DEB	4.4		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	3	060-070	DEB	4.4		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/B30	110-120	DEB	4.4		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	110-120	BIF	4.6		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	3	050-060	DEB	4.7		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	53/B27	050-060	PPT	4.7		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/ B25	110-120	DEB	4.8		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	130-140	DEB	4.8		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	130-140	DEB	4.9		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	120-130	DEB	5.2		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	160-170	DEB	5.2		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/B30	050-060	DEB	5.2		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0 / 83 0	110-120	DEB	5.2		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/830	130-140	DEB	5.4		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/830	130-140	DEB	5.4		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/B30	060-070	DEB	6.1		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
PLA-728/H	Upland	N0/830	090-100	DEB	6.1		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0 /B3 0	050-060	DEB	6.3		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	3	020-030	DEB	6.4		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/E25	050-060	PPT	7.9		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0 /E8	020-030	PPT	8.1		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	100-110	DEB	8.3		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/830	120-130	DEB	10.0		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/&30	150-160	DEB	10.1		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/830	140-150	DEB	10.3		BODIE	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/&30	180-190	PPT	4.0		BS/PP/FM	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	140-150	DEB	6.1		BS/PP/FM	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/B30	070-080	DEB	7.0		BS/PP/FM	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/B30	060-070	DEB	3.8		GRASSHOPPER	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/E25	040-050	DEB	2.4		MT. HICKS	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/B30	070-080	DEB	4.7		MT. HICKS	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/E25	070-080	BIF	2.3		MT. KONOCTI	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	060-070	BIF	3.1		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	3	060-070	DEB	3.4		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/E25	170-180	DEB	3.7		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/830	090-100	DEB	3.9		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	050-060	DEB	4.1		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3 /B25	120-130	DEB	4.1		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/B30	080-090	DEB	4.3		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/830	140-150	DEB	4.8		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3 /E25	070-080	BIF	4.9		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/E25	040-050	DEB	5.4		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/E25	100-110	DEB	5.4		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	3	070-080	DEB	5.5		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	3	030-040	DEB	6.3		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/E25	080-090	DEB	6.4		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	3	020-030	DEB	7.4		NAPA	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0 / 83 0	160-170	DEB	3.3		SUTRO	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	140-150	DEB	3.5		SUTRO	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N3/B25	090-100	DEB	4.6		SUTRO	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/B30	100-110	DEB	4.9		SUTRO	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
PLA-728/H	Upland	N0/B30	040-050	DEB	6.7		SUTRO	2200	10	679610	4317904	MARIPOSA-JOSEPHINE	0 pre-Quat
SAC-029	lowland		091-106		1.9		BODIE	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.0		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.1		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		061-076		1.2		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.2		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.2		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.3		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SAC-029	lowland		000-015		1.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		061-076		1.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		000-015		1.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		000-015		1.6		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		000-015		1.6		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		030-045		1.6		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		106-121		1.6		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.7		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.7		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		091-106		1.8		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		045-061		1.8		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				1.8		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		076-091		1.9		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		045-061		1.9		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		000-015		2.0		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				2.0		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		091-106		2.1		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		091-106		2.1		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		38		2.1		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		076-091		2.1		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				2.1		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				2.1		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				2.1		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				2.1		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				2.1		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		015-030		2.2		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		091-106		2.3		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				2.3		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				2.4		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		61		2.4		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		045-061		2.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		030-045		2.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		091-106		2.8		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		106-121		2.9		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		106-121		3.2		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				3.4		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				3.4		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SAC-029	lowland		167		3.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		61		3.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				3.9		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				4.5		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		182-198		4.7		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland				4.7		NAPA	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-029	lowland		045-061		2.3		QUEEN	5	10	628764	4265301	SAILBOAT-URBAN	6 latest-Holo
SAC-042	lowland	S11/E7	020-030	BIF	1.7		ANNADEL	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			BIF	2.4		BODIE	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			PPT	2.5		BODIE	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			PPT	3.0		BODIE	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			PPT	4.3		CASA D	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S8/W1.5	070-080	BIF	2.6		MT. HICKS	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S8/W1.5	030-040	BIF	1.3		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S8/W1.5	040-050	BIF	1.4		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			PPT	1.4		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S6.5/E3	010-020	BIF	1.6		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S9.5/E10	020-030	BIF	1.6		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			PPT	1.6		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S10/E10	020-030	BIF	1.7		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			PPT	1.7		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S21.5/W0.5	020-030	BIF	1.8		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S21.5/W0.5	020-030	BIF	1.8		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S8/W1.5	050-060	BIF	2.2		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S32/W1	020-030	BIF	2.2		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S32/W1	020-030	BIF	2.2		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S7/W1	050-060	BIF	2.3		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S7/W1	000-010	BIF	2.3		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S13.5/E3	000-010	DRL	2.3		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			BIF	2.3		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			BIF	2.3		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S6.5/W1	050-060	FTL	2.4		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S8/W1.5	010-020	BIF	2.4		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			BIF	2.4		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S22/W0.5	000-010	BIF	2.5		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			BIF	2.5		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			PPT	2.5		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			PPT	2.5		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S8/W1.5	050-060	BIF	2.6		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S8/W1.5	010-020	BIF	2.7		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			BIF	2.7		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			BIF	3.0		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland	S7/W1	050-060	BIF	3.6		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SAC-042	lowland	S45/E0	090-100	FTL	3.8		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			BIF	4.4		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-042	lowland			BIF	5.5		NAPA	15	10	626673	4260664	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E15	110-120	DEB	3.2		ANNADEL	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	Trench F	38		3.2		BODIE	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	020-030	DEB	3.5		BODIE	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	040-050	DEB	3.3		CASA D	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	050-060		3.8		CASA D	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	000-010		2.3		MONO	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland				1.2		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	060-070	DEB	1.3		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E11	040-050	BIF	1.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E11	060-070	BIF	1.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	S1 /E11	100-110	BIF	1.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	020-030	DEB	1.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E15	110-120	DEB	1.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	110-120	DEB	1.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	S7/E10	030-040	BIF	1.7		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	020-030	DEB	1.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E10	060-070		1.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland				1.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	070-080	DEB	1.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	040-050	DEB	1.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	S7/EI0	020-030	BIF	1.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	57/E10	010-020	DEB	1.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	57/E10	020-030	DEB	1.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E10	050-060	DEB	1.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland				1.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E11	000-010	BIF	1.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	020-030	DEB	1.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	040-050	DEB	1.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	020-030	BIF	2.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E10	100-110	DEB	2.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	000-010		2.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	050-060	BIF	2.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E15	030-040	BIF	2.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	050-060	BIF	2.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E15	040-050	DEB	2.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	060-070	DEB	2.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E10	070-080	DEB	2.1		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	020-030	DEB	2.1		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	020-030		2.1		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland				2.1		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SAC-043	lowland	S7:E10	000-010	DEB	2.2		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	S7/E10	010-020	DEB	2.2		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	050-060	DEB	2.2		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	SURFACE			2.2		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	020-030	DEB	2.2		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	020-030	DEB	2.2		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E20	35		2.3		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E20	35		2.3		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 :E7.5	000-060		2.3		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	SURFACE			2.3		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	040-050	DEB	2.3		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	020-030	DEB	2.3		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	Burial 50		BIF	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	S7/E10	000-010	DEB	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	070-080	DEB	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	080-090	DEB	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	020-030	DEB	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	040-050	DEB	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E29	35		2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E11	010-020		2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland				2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland				2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	Burial 80		PPT	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	070-080	DEB	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	020-030	DEB	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E15	040-050	DEB	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	130-140	DEB	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	020-030	DEB	2.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	070-080	DEB	2.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	080-090	DEB	2.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	020-030	DEB	2.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	000-050		2.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland				2.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	040-050	DEB	2.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	070-080	DEB	2.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E15	130-140	DEB	2.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	020-030	DEB	2.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	060-070	BIF	2.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	Burial 69		BIF	2.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	57/E10	050-060	DEB	2.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	040-050	DEB	2.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland				2.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland				2.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SAC-043	lowland	Trench F	38		2.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	040-050	DEB	2.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	S1 /E11	030-040	BIF	2.7		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	070-080	DEB	2.7		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	S10E11	010-020		2.7		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	Trench A	33		2.7		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E15	110-120	DEB	2.7		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	140-150	DEB	2.7		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	070-080	DEB	2.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	020-030	DEB	2.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	100-110		2.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland				2.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland				2.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	070-080	DEB	2.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	020-030	DEB	2.8		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	060-070	BIF	2.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	030-040	BIF	2.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	040-050	DEB	2.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E15	110-120	DEB	2.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E10	020-030	DEB	3.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E10	050-060	DEB	3.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	090-100	DEB	3.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E12	040-050	DEB	3.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	040-050	DEB	3.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	020-030	DEB	3.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	020-030	DEB	3.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	120-130	DEB	3.0		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	S7/E10	020-030	DEB	3.1		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	100-110	DEB	3.1		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	140-150	DEB	3.1		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E15	140-150	DEB	3.1		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	020-030	DEB	3.1		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	020-030	DEB	3.1		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/12	070-080	DEB	3.2		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	020-030	DEB	3.2		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	Burial?		BIF	3.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6:E20	35		3.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E15	140-150	DEB	3.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1 /E10	020-030	DEB	3.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N6/E15	050-060	DEB	3.5		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N4/E11	050-060	BIF	3.6		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland			BIF	3.9		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-043	lowland	N1/E10	070-080	DEB	6.4		NAPA	10	10	628839	4259676	VALPAC	6 latest-Holo

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SAC-043	lowland				2.7		QUEEN	10	10	628839	4259676	VALPAC	6 latest-Holo
SAC-060	lowland	Tr. B	31		5.2		ANNADEL	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	Tr. A-1	112		2.9		BODIE	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 38-11	122		3.8		BODIE	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 38-11	122		4.1		BODIE	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	CREMATION 34-1?	132		4.2		BODIE	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 34-2	147		3.5		CASA D	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 38-59	71		3.7		CASA D	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	Tr. A-1	66		2.4		MT. HICKS	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 34-16	48		2.4		NAPA	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 34-2	147		2.5		NAPA	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 34-2	147		2.6		NAPA	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 34-2	147		2.9		NAPA	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 34-2	147		2.9		NAPA	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 34-2	147		3.0		NAPA	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 34-2	147		3.1		NAPA	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 34-2	147		3.3		NAPA	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 38-10	81		3.8		NAPA	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 34-2	147		3.8		NAPA	5		0	0	DIERSSEN	1 EP-LP
SAC-060	lowland	BURIAL 38-28	104		6.3		NAPA	5		0	0	DIERSSEN	1 EP-LP
SAC-066	lowland	BURIAL 2	81		4.2		BODIE	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	BURIAL 2	81		4.3		BODIE	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	BURIAL 2	81		4.3		BODIE	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	N/A			3.6		CASA D	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	BURIAL 23	122		4.1		CASA D	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	BURIAL 41	50		4.4		CASA D	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	BURIAL 13	168		4.3		MONO	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	BURIAL 2	81		3.8		MT. HICKS	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	N/A			4.8		MT. HICKS	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	BURIAL 42	50		3.6		NAPA	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	BURIAL 2	81		4.3		NAPA	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	BURIAL 2	81		4.6		NAPA	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	BURIAL 15	152		4.9		NAPA	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-066	lowland	CREMATION 4	61		5.9		NAPA	5		634851	4235579	SAILBOAT	6 latest-Holo
SAC-099L	lowland				3.1		ANNADEL	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.1		ANNADEL	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.5		BODIE	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.5		BODIE	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.8		MONO	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.8		MONO	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		MONO	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		MONO	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				5.0		MT. HICKS	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SAC-099L	lowland				5.0		MT. HICKS	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				5.6		MT. HICKS	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				5.6		MT. HICKS	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				1.1		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				1.1		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				1.5		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				1.5		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				1.9		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				1.9		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.6		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.6		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.7		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.7		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.7		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.7		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.7		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.7		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.8		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.8		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.9		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.9		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.9		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				2.9		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.0		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.1		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.1		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.1		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.1		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.2		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.2		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.2		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.2		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SAC-099L	lowland				3.2		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.2		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.2		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.2		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.2		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.2		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.3		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.3		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.3		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.3		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.3		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.3		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.3		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.4		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.5		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.5		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.5		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.5		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.5		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.5		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.6		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.6		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.6		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.6		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.6		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.6		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.6		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.6		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.7		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.7		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.7		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.7		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.8		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SAC-099L	lowland				3.8		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.8		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.8		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.9		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				3.9		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				5.5		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				5.5		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				6.1		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				6.1		NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				7.2	0	NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099L	lowland				7.2	0	NAPA	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099U	lowland				3.5		N/A	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-099U	lowland				3.5		N/A	100		0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-107	lowland	BUR C8	132		4.2		NAPA	50	10	647284	4249075	MADERA	1 EP-LP
SAC-107	lowland	BUR C8	132		4.7		NAPA	50	10	647284	4249075	MADERA	1 EP-LP
SAC-127	lowland	N/Burial 95		PPT	2.5		NAPA	100	10	657528	4260866	REIFF	6 latest-Holo
SAC-127	lowland	Burial 5		PPT	2.5		NAPA	100	10	657528	4260866	REIFF	6 latest-Holo
SAC-127	lowland	N/Burial 95		PPT	2.5		NAPA	100	10	657528	4260866	REIFF	6 latest-Holo
SAC-127	lowland	N/Burial 95		PPT	2.8		NAPA	100	10	657528	4260866	REIFF	6 latest-Holo
SAC-127	lowland	N/Burial 95		PPT	2.9		NAPA	100	10	657528	4260866	REIFF	6 latest-Holo
SAC-133	lowland	553/E26	010-020	DEB	1.8		BODIE	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S41/E19	060-070	DEB	2.5		BODIE	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	040-050	DEB	4.9		BODIE	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N10/E20	010-020	DEB	5.2		BODIE	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N44/E10	020-030	DEB	6.2		BODIE	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	553/E26	050-060	DEB	6.6		BODIE	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N44/E10	000-010	DEB	7.3		BORAX	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S76/E19	010-020	DEB	5.6		CASA D	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	030-040	DEB	5.0		MONO	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	010-020	DEB	2.2		N/A	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	553/E26	090-100	DEB	2.7		N/A	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	040-050	DEB	2.9		N/A	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	020-030	DEB	3.3		N/A	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S76/E19	130-140	DEB	6.2		N/A	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S1/E16	040-050	FTL	1.3		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	010-020	DEB	1.3		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	552/E26	010-020	FTL	1.4		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	010-020	DEB	1.4		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	010-020	BIF	1.6		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N10/E20	000-010	PPT	1.6		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	010-020	DEB	1.7		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	010-020	DEB	1.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S76/E19	030-040	DEB	1.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SAC-133	lowland	S41/E19	060-070	DEB	2.2		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	040-050	DEB	2.2		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	060-070	DEB	2.3		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S41/E19	050-060	PPT	2.4		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S41/E19	060-070	DEB	2.4		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	552/E25	050-060	PPT	2.4		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	552/E26	020-030	BIF	2.4		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S76/E19	020-030	DEB	2.4		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S41/E19	060-070	DEB	2.5		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	552/E25	090-110	BIF	2.5		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	553/E26	050-060	DEB	2.5		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	090-100	DEB	2.5		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S41/E19	050-060	PPT	2.6		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	552/E25	090-110	DEB	2.6		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	552/E26	080-090	BIF	2.6	3.4	NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	040-050	DEB	2.6		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	090-100	DEB	2.6		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N10/E20	020-030	DEB	2.6		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	040-050	DEB	2.7		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	552/E26	080-090	BIF	2.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	553/E26	010-020	DEB	2.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	090-100	DEB	2.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S76/E19	100-110	BIF	2.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S82.5/E10.5	040-050	BIF	2.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	553/E26	090-100	DEB	2.9		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	553/E26	090-100	DEB	2.9		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	040-050	DEB	2.9		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	090-100	DEB	2.9		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S41/E19	060-070	DEB	3.0		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	553/E26	050-060	DEB	3.0		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	020-030	DEB	3.0		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	552/E25	090-110	DEB	3.3		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	040-050	DEB	3.3		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	553/E26	020-030	BIF	3.5		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	090-100	DEB	3.5		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S76/E19	020-030	DEB	3.5		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	010-020	DEB	3.6		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S41/E19	040-050	BIF	3.7		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	553/E26	090-100	DEB	3.7		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S76/E19	080-090	BIF	3.7		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S76/E19	130-140	DEB	3.7		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N10/E20	020-030	DEB	3.7		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S76/E19	130-140	DEB	3.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SAC-133	lowland	S76/E19	130-140	DEB	3.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	050-060	BIF	3.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4 /E7	030-040	DEB	4.0		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	130-140	DEB	4.3		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	130-140	DEB	4.3		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	130-140	DEB	4.4		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	020-030	DEB	4.5		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	553/E26	020-030	BIF	4.7		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	130-140	DEB	4.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S76/E19	070-080	BIF	4.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N10/E20	010-020	DEB	5.0		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	552/E25	090-110	DEB	5.1		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S2/W3	020-030	FTL	5.5		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	060-070	DEB	5.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S76/E19	130-140	DEB	5.9		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	130-140	BIF	6.0		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	050-060	BIF	6.0		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	070-080	FTL	6.1		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N10/E20	050-060	DEB	6.4		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N10/E20	010-020	DEB	6.8		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N10/E20	020-030	FTL	7.0		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	120-130	BIF	7.5		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	S74/E19	140-150	BIF	10.2		NAPA	125	10	660466	4262153	KEYES	1 EP-LP
SAC-133	lowland	N4/E7	010-020	BIF	2.1		QUEEN	125	10	660466	4262153	KEYES	1 EP-LP
SAC-333	lowland	N28/W3	000-015		1.6		MONO			0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-333	lowland	N42/W7	000-015		0.8		NAPA			0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-333	lowland	N20/W6	000-015		1.7		NAPA			0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-333	lowland	N9/E2	000-015		2.3		NAPA			0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-333	lowland	N14/E2	024-024		2.4		NAPA			0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-333	lowland	N12/W7	000-015		2.5		NAPA			0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-333	lowland	N8/W3	027-027		2.8		NAPA			0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-333	lowland	N50/W5	SURFACE		3.3		NAPA			0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-333	lowland	N14/W1	012-012		3.5		NAPA			0	0	ORANGEVALE-KASEBERG	1 EP-LP
SAC-344/H	upland	STU-51	020-040	BIF	2.4		CASA D	300	10	661624	4278975	ARGONAUT-AUBURN	0 pre-Quat
SAC-344/H	upland	T-10	018-046	BIF	2.5		NAPA	300	10	661624	4278975	ARGONAUT-AUBURN	0 pre-Quat
SAC-344/H	upland	SCU-70	SURFACE	BIF	3.6		NAPA	300	10	661624	4278975	ARGONAUT-AUBURN	0 pre-Quat
SAC-344/H	upland	T-10	018-046	BIF	2.5		QUEEN	300	10	661624	4278975	ARGONAUT-AUBURN	0 pre-Quat
SAC-370	upland	50N/15W	010-020	DEB	11.0	10.5	BORAX	250	10	667147	4265222	WATER	0 pre-Quat
SIE-027	upland		SURFACE	DEB	4.5		GRASSHOPPER	6300	10	736085	4380076	ALDI-KYBURZ	0 pre-Quat
SIE-027	upland		SURFACE	PPT	2.2		N/A	6300	10	736085	4380076	ALDI-KYBURZ	0 pre-Quat
SIE-406/H	upland		SURFACE	DEB	1.0		BODIE	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland	2	000-010	DEB	2.0		BODIE	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland		SURFACE	DEB	2.5		BODIE	6500	10	752133	4378919	ROUEN	0 pre-Quat

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SIE-406/H	upland		SURFACE	DEB	2.7		BODIE	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland		SURFACE	DEB	2.7		BODIE	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland		SURFACE	BIF	2.9		BODIE	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland	N20/E0	000-010	DEB	3.4		BODIE	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland		SURFACE	DEB	4.2		BODIE	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland	1	030-040	DEB	4.9		BODIE	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland		SURFACE	DEB	1.0		DUCK FLAT	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland		SURFACE	DEB	2.3		DUCK FLAT	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland	S40/E20	000-010	DEB	2.8		DUCK FLAT	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland		SURFACE	FFT	0.8		N/A	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland	3	010-020	DEB	1.0		N/A	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland	N0/W20	000-010	DEB	1.2		NAPA	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland		SURFACE	DEB	2.2		SOUTH WARNER	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland	N0/E0	000-010	DEB	3.0		SOUTH WARNER	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland		SURFACE	DEB	4.7		SOUTH WARNER	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland	S20/E20	000-010	PPT	0.9		SUTRO	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-406/H	upland	S20/E20	000-010	DEB	1.0		SUTRO	6500	10	752133	4378919	ROUEN	0 pre-Quat
SIE-411/H	upland	S.5/W6	020-030	DEB	2.2		BODIE	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N2/W8	020-030	DEB	3.3		BODIE	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N2/W7	030-040	DEB	3.3		BODIE	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N2/W9	020-030	DEB	3.5		BODIE	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N4/W6.5	010-020	DEB	3.3		BUCK MT.	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N3/W7.5	020-030	DEB	2.1		CASA D	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N3/W7.5	000-010	DEB	1.3		EAST MLH	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	S.5/W6	010-020	DEB	1.3		EAST MLH	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N2/W11	030-040	DEB	1.8		EAST MLH	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	SURFACE	SURFACE	DEB	2.1		EAST MLH	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N2/W10	030-040	DEB	2.7		EAST MLH	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N3/W7.5	020-030	DEB	3.3		EAST MLH	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N4/W6.5	010-020	DEB	3.3		EAST MLH	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N2/W8	030-040	DEB	3.3		EAST MLH	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N4/W6.5	020-030	DEB	3.4		EAST MLH	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N2/W9	010-020	DEB	3.4		EAST MLH	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	N2/W9	020-030	DEB	3.4		EAST MLH	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-411/H	upland	S5.5/W11	SURFACE	BIF	3.0		SOUTH WARNER	4808	10	677387	4393998	SMOKEY	0 pre-Quat
SIE-800	upland		SURFACE	PPT	2.0		BODIE	6560	10	737805	4382706	AQUOLLS AND BOROLLS	5 late-Holo
SIE-800	upland		SURFACE	DEB	2.4		BODIE	6560	10	737805	4382706	AQUOLLS AND BOROLLS	5 late-Holo
SIE-800	upland		SURFACE	PPT	3.3	3.7	DUCK FLAT	6560	10	737805	4382706	AQUOLLS AND BOROLLS	5 late-Holo
SIE-800	upland		SURFACE	PPT	1.2		GRASSHOPPER	6560	10	737805	4382706	AQUOLLS AND BOROLLS	5 late-Holo
SIE-800	upland		SURFACE	DEB	3.1		GRASSHOPPER	6560	10	737805	4382706	AQUOLLS AND BOROLLS	5 late-Holo
SIE-800	upland		SURFACE	DEB	2.6		N/A	6560	10	737805	4382706	AQUOLLS AND BOROLLS	5 late-Holo
SIE-800	upland		SURFACE	DEB	5.0		NAPA	6560	10	737805	4382706	AQUOLLS AND BOROLLS	5 late-Holo
SIE-801	upland		SURFACE	DEB	3.9		BODIE	6440	10	738545	4383296	KYBURZ-ALDI	0 pre-Quat

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
SIE-801	upland		SURFACE	DEB	2.7		BUCK MT.	6440	10	738545	4383296	KYBURZ-ALDI	0 pre-Quat
SIE-801	upland		SURFACE	DEB	1.6		DUCK FLAT	6440	10	738545	4383296	KYBURZ-ALDI	0 pre-Quat
SIE-801	upland		SURFACE	FFT	2.9		DUCK FLAT	6440	10	738545	4383296	KYBURZ-ALDI	0 pre-Quat
SIE-801	upland		SURFACE	DEB	3.7		GRASSHOPPER	6440	10	738545	4383296	KYBURZ-ALDI	0 pre-Quat
SIE-801	upland	N0/W60	000-010	DEB	1.3		N/A	6440	10	738545	4383296	KYBURZ-ALDI	0 pre-Quat
SIE-801	upland		SURFACE	DEB	2.6		N/A	6440	10	738545	4383296	KYBURZ-ALDI	0 pre-Quat
SIE-801	upland		SURFACE	DEB	2.7		N/A	6440	10	738545	4383296	KYBURZ-ALDI	0 pre-Quat
SUT-017	Lowland	1	120-130	BIF	4.0	3.2	BORAX	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	1	030-040	FFT	1.2		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	1	020-030	FFT	1.3		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	2	030-040	DEB	1.4		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	2	010-020	BIF	1.6		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	2	020-030	FFT	1.7		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	2	040-050	DEB	2.8		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	1	130-140	DEB	3.1		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	2	050-060	DEB	3.3		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	1	110-120	BIF	3.4		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	1	170-180	BIF	3.8		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	3	070-080	DEB	4.2		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	1	140-150	DEB	9.6		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
SUT-017	Lowland	3	040-050	DEB	14.8		NAPA	50	10	620954	4318939	CONEJO	5 late-Holo
WILLOW SLOUGH	Lowland				2.7		NAPA	50	10	609357	4275588	RINCON	3 Early-Holo
WILLOW SLOUGH	Lowland				2.8		NAPA	50	10	609357	4275588	RINCON	3 Early-Holo
WILLOW SLOUGH	Lowland				3.5		NAPA	50	10	609357	4275588	RINCON	3 Early-Holo
WILLOW SLOUGH	Lowland				3.9		NAPA	50	10	609357	4275588	RINCON	3 Early-Holo
WILLOW SLOUGH	Lowland				3.9		NAPA	50	10	609357	4275588	RINCON	3 Early-Holo
WILLOW SLOUGH	Lowland				5.2		NAPA	50	10	609357	4275588	RINCON	3 Early-Holo
WILLOW SLOUGH	Lowland				6.0		NAPA	50	10	609357	4275588	RINCON	3 Early-Holo
YOL-069	Lowland		SURFACE	PPT	1.3		BORAX	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-7	020-030	DRL	1.8	12.4	BORAX	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	030-040	DEB	1.8		BORAX	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	PPT	1.9		BORAX	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-2	060-070	DEB	1.4		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	STU 1-5	000-020	PPT	1.5		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	F-7	067-89	PPT	1.5		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	PPT	1.5		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	BIF	1.5	5.2	NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-5	030-040	EMF	1.5		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	EMF	1.5		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	010-020	CORE	1.5		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	000-010	DEB	1.5		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	030-040	DEB	1.5		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-2	060-070	DEB	1.5		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
YOL-069	Lowland	F-1	059-072	DEB	1.5		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-56	000-010	PPT	1.6		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	BIF	1.6	3.3	NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	BIF	1.6	3.3	NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	000-010	CORE	1.6		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-2	000-010	DEB	1.6		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-2	030-040	DEB	1.6		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	F-1	059-072	DEB	1.6		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	STU 2-6	000-020	PPT	1.7		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	PPT	1.7		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	000-010	EMF	1.7	4.9	NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	B-84	067-89	EMF	1.7	3.9	NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	000-010	DEB	1.7		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	000-010	DEB	1.7		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	030-040	DEB	1.7		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	060-080	DEB	1.7		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	060-080	DEB	1.7		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-2	030-040	DEB	1.7		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-2	030-040	DEB	1.7	5.7	NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-5E	040-060	PPT	1.8		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	F-5	031-055	PPT	1.8		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	PPT	1.8		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	BIF	1.8		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	BIF	1.8		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	DRL	1.8		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-2	020-030	EMF	1.8		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-1	060-080	DEB	1.8		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-2	000-010	DEB	1.8		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-2	000-010	DEB	1.8		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-2	060-070	DEB	1.8		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	PPT	1.9		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-3	030-040	BIF	1.9		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	BIF	1.9		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-2	000-010	EMF	1.9	6.5	NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	B-55	048-073	PPT	2.0		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland		SURFACE	PPT	2.6		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-069	Lowland	EU-4	020-030	BIF	3.5		NAPA	125	10	593702	4282714	SYCAMORE	6 latest-Holo
YOL-161	Lowland	STU8	010-010	DEB	4.1		NAPA	440	10	578784	4308776	CORNING	1 EP-LP
YOL-161	Lowland	N76/W18	SURFACE	DEB	4.2		NAPA	440	10	578784	4308776	CORNING	1 EP-LP
YOL-161	Lowland	STU3	010-010	DEB	4.3		NAPA	440	10	578784	4308776	CORNING	1 EP-LP
YOL-175	Lowland		160-200		1.6		N/A	210	10	585742	4275886	YOLO	5 late-Holo
YOL-175	Lowland		160-200		1.6		N/A	210	10	585742	4275886	YOLO	5 late-Holo
YOL-175	Lowland		160-200		1.7		N/A	210	10	585742	4275886	YOLO	5 late-Holo

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
YOL-175	Lowland		160-200		1.9		N/A	210	10	585742	4275886	YOLO	5 late-Holo
YOL-175	Lowland		160-200		2.4		N/A	210	10	585742	4275886	YOLO	5 late-Holo
YOL-175	Lowland		160-200		2.5		N/A	210	10	585742	4275886	YOLO	5 late-Holo
YOL-182	Lowland		000-010		0.9		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		010-020		1.0		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		030-040		1.0		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		030-040		1.0		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		030-040		1.1		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		050-060		1.1		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		050-060		1.1		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		070-080		1.1		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		000-010		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		000-010		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		010-020		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		010-020		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		010-020		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		020-030		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		030-040		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		030-040		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		040-050		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		040-050		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		040-050		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		050-060		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		060-070		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		060-070		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		080-090		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		090-100		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		110-120		1.2		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		010-020		1.3		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		020-030		1.3		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		030-040		1.3		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		060-070		1.3		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		070-080		1.3		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		070-080		1.3		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		070-080		1.3		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		070-080		1.3		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		080-090		1.3		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		100-110		1.3		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		100-110		1.3		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		020-030		1.4		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		050-060		1.4		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		050-060		1.4		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		080-090		1.4		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
YOL-182	Lowland		020-030		1.5		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		080-090		1.6		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		020-030		1.7		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		030-040		1.7		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		040-050		1.7		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-182	Lowland		060-070		2.1		NAPA	45	10	609474	4266325	SYCAMORE	6 latest-Holo
YOL-187	Lowland				0.9		BORAX	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				2.2	8.6	BORAX	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	0.7		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	0.8		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		80-90	DEB	0.9		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	0.9		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	0.9		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	0.9		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	0.9		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	0.9		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	0.9		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				0.9		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				0.9		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		80-90	DEB	1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		80-90	DEB	1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		80-90	DEB	1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		80-90	DEB	1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.0		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		80-90	DEB	1.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		80-90	DEB	1.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		>N/A	DEB	1.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo

Appendix C: Obsidian Source and Hydration Information

Siteno	Context	Unit	CM_LEVEL	Name1	BAND1	BAND2	Source	Elevation	Zone	UTMmE83	UTMmN83	Soil Series Name	Map Unit Age
YOL-187	Lowland		N/A	DEB	1.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		80-90	DEB	1.2		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.2		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.2		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.2		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.2		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.2		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.2		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				1.3		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.4		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.6		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland		N/A	DEB	1.8		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-187	Lowland				3.1		NAPA	50	10	603732	4287501	YOLO	5 late-Holo
YOL-197	Lowland	CU 1	000-010	BIF	1.4		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 2A	030-040	EMF	1.4		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	TRE 1		BIF	1.4		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 3A	060-070	DEB	1.5		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 2	020-030	DEB	1.6		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 2	020-030	EMF	1.6	3.6	NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	TRE 2		DEB	1.6		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 17	025-045	DEB	1.7		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	TRE 3		EMF	1.7		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 3A	020-030	DEB	1.9		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 5	050-060	DEB	1.9		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 5	040-050	DEB	2.0		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 5	020-030	DEB	2.1		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 8	020-030	EMF	2.1		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 2A	000-010	EMF	2.2		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 12	020-040	PPT	2.2		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	MF		BIF	2.2		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 3A	050-060	DEB	2.6		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 9A	030-050	PPT	2.8	5.9	NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YOL-197	Lowland	CU 15	040-050	BIF	3.2		NAPA	50	10	608982	4265829	REIFF	6 latest-Holo
YUB-1157	Lowland	SP N80	000-025	DEB	2.0		NAPA	42	10	641514	4327331	CONEJO	5 late-Holo
YUB-1157	Lowland	CU 2	080-100	DEB	2.5		NAPA	42	10	641514	4327331	CONEJO	5 late-Holo
YUB-1157	Lowland	SET 7-23-7	040-080	DEB	2.7		NAPA	42	10	641514	4327331	CONEJO	5 late-Holo

APPENDIX D

DESIGNATIONS FOR SOIL HORIZONS AND LAYERS

APPENDIX D

D1 – GLOSSORY OF TERMS FOR SOIL HORIZONS AND LAYERS

SELECTED GEOLOGICAL TERMS USED IN TEXT

Anticline – An upward fold shaped like an arch in cross-section; opposite of a syncline.

Argillic horizon – A subsurface accumulation of silicate clay as compared to the overlying soil material (see "B" and "t" in *D-2 Soil Designations*).

Calcic horizon – An illuvial horizon in which secondary calcium carbonate (CaCO3) or other carbonates have accumulated to a significant extent (see "B" and "k" in *D-2 Soil Designations*).

Cambic horizon – Physical alterations, chemical transformations, or removals, or a combination of two or more of these processes, that result in measurable color and/or structure differences in the subsurface of a soil profile as compared to the overlying and underlying soil material (see "B" and "w" in *D-2 Soil Designations*).

Cosmogenic Radionuclide – A radioactive isotope created when a high-energy cosmic ray interacts with the nucleus of an atom.

Cumulic horizon – A surface or near-surface horizon in which sediment deposition and soil development have kept pace with each other to form an over-thickened A horizon.

Igneous – Rocks formed by solidification of cooled magma (molten rock), with or without crystallization, either below the surface as intrusive (plutonic) rocks or on the surface as extrusive (volcanic) rocks.

Monocline – A sharp bend in a bed that has the same dip on either side of the bend.

Moraine – Any glacially formed deposit of unconsolidated debris.

Protalus Rampart – An arched (or curved) ridge consisting of boulders and other coarse debris marking the downslope edge of an existing or melted snowbank.

Sedimentary – Rocks formed from sediments.

Silicic – Rocks rich in silica.

Syncline – A downward fold shaped like the letter U in cross-section; opposite of anticline.

Till – Unsorted glacial sediment.

D2 – DESIGNATIONS FOR SOIL HORIZONS AND LAYERS

Adapted mainly from:
Internet Glossary of Soil Science Terms
Soil Science Society of America
https://www.soils.org/sssagloss/appendix2.html

Three kinds of symbols are used in combination to designate horizons and layers—capital letters, lower case letters, and arabic numbers. Capital letters are used to designate master horizons and layers, lower case letters are used as suffixes to indicate specific characteristics of the master horizon and layer, and arabic numerals are used both as suffixes to indicate vertical subdivisions within a horizon or layer and as prefixes to indicate discontinuities. Genetic horizons are not the equivalent of the diagnostic horizons of the U.S. soil taxonomy. Designations of genetic horizons express a qualitative judgment about the vector of changes that are believed to have taken place. Diagnostic horizons are quantitatively defined features used to differentiate between taxa in the U.S. system of soil taxonomy. Horizon symbols indicate the direction of presumed pedogenesis (soil evolution) while diagnostic horizons indicate the magnitude of that expression. The most commonly used symbols are defined below.

Master Horizons and Layers

O horizons – Layers dominated by organic material.

A horizons – Mineral horizons that formed at the surface or below an O horizon that exhibit obliteration of all or much of the original rock structure and are characterized by an accumulation of humified organic matter intimately mixed with the mineral fraction and not dominated by properties characteristic of E or B horizons (i); or have properties resulting from cultivation, pasturing, or similar kinds of disturbance (ii).

E horizons – Mineral horizons in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these, that leaves a concentration of sand and silt particles of quartz or other resistant materials.

B horizons – Horizons that formed below an A, E, or O horizon and are dominated by obliteration of all or much of the original rock structure and show one or more of the following:

- illuvial concentration of silicate clay, iron, aluminum, humus, carbonates, gypsum, or silica, alone or in combination;
- evidence of removal of carbonates;
- residual concentration of sesquioxides (any oxide with three oxegen atoms for every two metal atoms);
- coatings of sesquioxides that make the horizon conspicuously lower in value, higher in chroma, or redder in hue than overlying and underlying horizons without apparent illuviation of iron;
- alteration that forms silicate clay or liberates oxides or both and that forms granular, blocky, or prismatic structure if volume changes accompany changes in moisture content; or brittleness.

K horizons – A mineral horizon impregnated by carbonate such that the carbonate dominates its morphology; generally well cemented (not officially recognized by the Soil Conservation Service).

C horizons or layers – Horizons or layers, excluding hard bedrock, that are little affected by pedogenic processes and lack properties of O, A, E, or B horizons. The material of C horizons may be either like or unlike that from which the solum (set of related soil horizons) presumably formed. The C horizon may have been modified even if there is no evidence of pedogenesis.

R layers – Hard bedrock including granite, basalt, quartzite and indurated limestone or sandstone that is sufficiently coherent to make hand digging impractical.

Transitional Horizons

Two kinds of transitional horizons are recognized. In one, the horizon is dominated by properties of one master horizon but has subordinate properties of another. Two capital letter symbols are used, such as AB, EB, BE, or BC. The master horizon symbol that is given first designates the kind of master horizon whose properties dominate the transitional horizon. In the other transitional horizon, distinct parts of the horizon have recognizable properties of the two kinds of master horizons indicated by the capital letters. The two capital letters are separated by a virgule (/), as E/B, B/E, or B/C. The first symbol is that of the horizon that makes up the greater volume, (e.g., BE is a horizon with characteristics of both an overlying E horizon and an underlying B horizon, but which is more like the B than the E, while B/E is a horizon comprised of individual parts of E and B horizon in which the E component surrounds the B component but the latter is dominant).

Subordinate Distinctions within Master Horizons and Layers

a – Highly decomposed organic material where rubbed fiber content averages <1/6 of the volume.

b – Identifiable buried genetic horizons in a mineral soil.

c – Concretions or nodules with iron, aluminum, manganese or titanium cement.

d – Physical root restriction, either natural or manmade such as dense basal till, plow pans, and mechanically compacted zones.

e – Organic material of intermediate decomposition in which rubbed fiber content is 1/6 to 2/5 of the volume.

f – Frozen soil in which the horizon or layer contains permanent ice.

g – Strong gleying in which iron has been reduced and removed during soil formation or in which iron has been preserved in a reduced state because of saturation with stagnant water.

h – Illuvial accumulation of organic matter in the form of amorphous, dispersible organic matter-sesquioxide complexes.

i – Slightly decomposed organic material in which rubbed fiber content is more than about 2/5 of the volume.

k – Accumulation of pedogenic carbonates, commonly calcium carbonate.

m – Continuous or nearly continuous cementation or induration of the soil matrix by carbonates (km), silica (qm), iron (sm), gypsum (ym), carbonates and silica (kqm), or salts more soluble than gypsum (zm).

n – Accumulation of sodium on the exchange complex sufficient to yield a morphological appearance of a natric horizon.

o – Residual accumulation of sesquioxides.

p – Plowing or other disturbance of the surface layer by cultivation, pasturing, or similar uses.

q – Accumulation of secondary silica.

r – Weathered or soft bedrock including saprolite; partly consolidated soft sandstone, siltstone or shale; or dense till that roots penetrate only along joint planes and are sufficiently incoherent to permit hand digging with a spade.

s – Illuvial accumulation of sesquioxides and organic matter in the form of illuvial, amorphous, dispersible organic matter-sesquioxide complexes if both organic matter and sesquioxide components are significant and the value and chroma of the horizon are >3.

ss – Presence of slickensides (i.e., pressure faces created by shrinking and swelling of clay-rich soils).

t – Accumulation of silicate clay that either has formed in the horizon and is subsequently translocated or has been moved into it by illuviation (i.e., argillic horizon).

v – Plinthite is an iron-rich, humus-poor, reddish material that is firm or very firm when moist and that hardens irreversibly when exposed to the atmosphere under repeated wetting and drying.

w – Development of color or structure in a horizon but with little or no apparent illuvial accumulation of materials.

x – Fragic or fragipan (altered subsurface soil layers that restrict water flow and root penetration) characteristics that result in genetically developed firmness, brittleness, or high bulk density.

y – Accumulation of gypsum.

z – Accumulation of salts more soluble than gypsum.