Chapter 2: Contextual Background

ENVIRONMENT

The natural setting of the project area is a forested riparian environment (Figure 4). Immediately west of the project area, Donner Creek exits Donner Lake and courses east through the project area (see Figure 2 and Figure 3). Here it cuts through a glacial landscape of narrow low moraine ridges and broad terraces. A wetland floodplain is present downstream from the project area at the eastern site boundary. The creek continues east for only a mile before turning southeast to confluence with the Truckee River.

The creek-side terraces are forested with sparse to moderately dense stands of Jeffrey pine (*Pinus jeffreyi*), white fir (*Abies concolor*) and lodgepole pine (*Pinus contorta*). The forest floor is predominantly open, covered with a thick duff. Granitic sands are exposed in larger openings

Figure 4. Forested Riparian Environment.

between forest stands. The sparse understory vegetation includes bitterbrush (*Purshia tridentata*), service berry (*Amelanchier utahensis*), woolly mules ears (*Wyethia mollis*) and sagebrush (*Artemesia tridentata*). Manzanita (*Arctostaphylos patula*) grows in open areas along the roadways and small numbers of aspens (*Populas tremuloides*) are found on wet ground.

The modern Donner Creek environment serves as a point of reference for looking back at past environments and landforms sculpted by paleoclimatic conditions, and experienced and used by prehistoric inhabitants. At just under 6,000 feet in elevation, the ecology along Donner Creek is characterized as predominantly *yellow pine zone* or *mixed conifer zone* (USDA Forest Service 2001).

Ethnobotanical plants recorded for the *yellow pine zone* are abundant (Jackson et al. 1994a:Table 6-2). A few plants, in addition to those listed above, that might have been most common to Donner Creek include wild onion (*Allium* sp.), gooseberries and currants (*Ribes* sp.), huckleberry oak (*Quercus vaccinifolia*), willow (*Salix* sp.), wild rose (*Rosa* sp.), bracken fern (*Pteridium aquilinum*), lilies (*Lilium* sp.), bromegrass (*Bromus* sp.) and needlegrass (*Stipa* sp.).

The predominant large mammals available to Donner Creek residents included mule deer (*Odocoileus hemionus*) and probably mountain sheep at higher elevations (*Ovis canadensis*; d'Azevedo 1986). Hares and rabbits were abundant throughout Washoe territory (d'Azevedo 1986). Other mammals probably included marmots (*Marmota flaviventris*), badgers (*Taxidea taxus*), porcupine (*Erethizon dorsatum*), beaver (*Castor canadensis*), ground squirrels (*Citellus beldingi* and *lateralis*), chipmunks (*Eutamias* spp.) and gophers (*Thomomys* spp.).

The Truckee River was the conduit between two great fisheries at Tahoe and Pyramid Lake, which did not dry up during the Middle Holocene (Lindström et al. 2002). Cutthroat trout (*Salmo clarki henshawi*) and white fish (*Prosopium williamsoni*) were abundant in Tahoe, approximately 12 miles up the Truckee River from Donner Creek (Lindström 1992). Fish in the Truckee River would have been plentiful during times when the water poured from Tahoe's outflow. Cutthroat, suckers (*Catostomus* sp.), tui chub (*Gila bicolor*) and other small fishes probably inhabited Donner Creek. Remnant fish populations might have remained available in the Truckee River and Donner Creek during times of low water.

PALEOENVIRONMENT

In the past, glaciation and a cold/dry climate dominated the Donner Creek area until about 10,000 years ago. Glacial termination marks the beginning of the Early Holocene, a period of climatic change from approximately 10,000 to 7000 BP when the general climate was in a warming and drying trend, but with cool and moist winters. The Donner Creek area was initially occupied during the Early Holocene as the glacial landscape became more accessible with an increasing diversity of plant and animal resources common to coniferous forests. Flora and fauna at that time were the precursors to historic ecological communities.

The Middle Holocene, from 7000 to 4000 BP, saw an increased warm/dry climate, to the point of drought conditions. Precipitation fell primarily as summer rains with decreased winter snow. Tahoe's waterline fell at least 20 feet and it is likely that smaller lakes and streams became seasonally desiccated. Vegetation likely changed to drought tolerant xeric plants with animal populations adapted to a xeric ecology. Populations and the

consistency of site occupations increased along Donner Creek during this time period. Increased site use may have been a response to reliable water at Donner Lake.

Eventually, more modern Late Holocene conditions prevailed setting the stage for continued habitation after 4000 BP. Late Holocene conditions were generally cool and moist with wet winters, but with periods of extended drought (Stine 1990, 1998). During most of this period, Tahoe Sierran landforms were essentially the same as they appear today. Vegetation and animal communities have been altered by historic activities, but, except for the extinction of grizzly bears, wolverines and mountain sheep, and the cutting of old growth forest, the predominant prehistoric character of the Donner Creek landscape remain largely representative of the Late Holocene paleoenvironment.

Detailed research on the topic of Tahoe Sierra paleoclimate is found in *The Lake Tahoe Environmental Improvement Program, Volume 1, Contextual Background: Lake Tahoe Outlet* (Lindström et al. 2002), and in *The Lake Tahoe Watershed Assessment*, Vol. 1, Chapter 2 (Lindström et al. 2000).

PREHISTORY

Current understanding of northern Sierra Nevada and western Great Basin prehistory is framed within a hypothetical sequence spanning nearly 12,000 years of environmental change and human adaptation (Elston 1986; Grayson 1993). The archaeological phenomena, which generally reflect the adaptive strategies used in prehistory to cope with changing environments and evolving social dynamics, are chronologically organized into five time periods (Western Great Basin Adaptive Sequence:Table 1). Within this overarching framework, a regional chronology for the Eastern Sierra Front has been developed through substantial programs of archaeological investigation throughout the northern Sierra and the Truckee Meadows (Elston 1971; Elston et al. 1977; Elston et al. 1994, 1995a; Moore and Burke 1992; Zeier and Elston 1986). The Eastern Sierra Front Chronology (Elston et al. 1994, 1995a) provides a relevant temporal framework for comparing and interpreting Tahoe Sierra archaeology (Table 1). A new taxonomic framework for ordering Tahoe Sierran archaeology has been recently proposed to augment the established chronological sequence (Lindström et al. 2002:Table 7). This new taxonomic framework adds spatial and cultural dimensions to the Eastern Sierra Front Chronology.

The earliest recognized period in western Great Basin prehistory, from ca. 11,500 to 10,000 BP, is marked by the presence of fluted projectile points. Most Great Basin fluted points are surface finds from Late Pleistocene/Early Holocene lakeshores. Grayson (1993) suggests that this is because plants and animals associated with shallow lakes and the surrounding steppe would have been the most abundant local food resources of that time.

Pre-Archaic sites date from ca. 10,000 to 7000 BP and are located on lakeshores, river terraces, and high ground above valleys (Basgall 1988; Davis and Rusco 1987; Martin 1998; Willig 1988; Zancanella 1988). The local archaeological record suggests that prehistoric populations occupied the Tahoe Sierra for at least 8,000 to 9,000 years. Soon after the Early Holocene retreat of Sierran glaciers, people probably entered the Tahoe/ Truckee Basin. The earliest well dated archaeological evidence of human presence is marked by a Pre-Archaic stone tool assemblage from South Lake Tahoe along Taylor Creek (Martin 1998). Subsistence adaptation at this time probably relied on high residential mobility in the pursuit of large game animals (Elston et al. 1995b) and non-intensive plant

food processing and storage. The use of fluted points is thought to have continued into the Pre-Archaic, but the most distinctive tools in the Pre-Archaic toolkit are large, stemmed, edge-ground projectile points of the Great Basin Stemmed series and enigmatic flaked stone crescents. These are the temporal markers representing northern Sierra occupation during the Tahoe Reach Phase (Elston et al. 1995a).

Table 1. Western Great Basin and Eastern Sierra Front Chronologies and Tahoe Sierra Taxonomy.

<table>
<tr><th colspan="2">WESTERN GREAT BASIN</th><th rowspan="2">YEARS B.P.*</th><th>EASTERN SIERRA FRONT*</th><th>TAHOE SIERRA**</th><th rowspan="2">TEMPORALLY DIAGNOSTIC PROJECTILE POINTS*</th></tr>
<tr><th>CULTURAL/ EVOLUTIONARY UNIT **</th><th>ADAPTIVE SEQUENCE*</th><th>CHRONOLOGY</th><th>SPATIAL/ CULTURAL UNIT</th></tr>
<tr><td rowspan="7">Archaic Stage</td><td rowspan="2">Late Archaic Period</td><td>700</td><td>Late Kings Beach Phase</td><td rowspan="2">Washoe Tahoe Pattern</td><td>Desert series</td></tr>
<tr><td>1300</td><td>Early Kings Beach Phase</td><td>Rose Spring series</td></tr>
<tr><td rowspan="2">Middle Archaic Period</td><td>3000</td><td>Late Martis Phase</td><td rowspan="3">Tahoe Sierra Pattern</td><td>Martis Corner-notched, Elko Corner-notched and Elko Eared</td></tr>
<tr><td rowspan="2">5000</td><td rowspan="2">Early Martis Phase</td><td rowspan="2">Martis Contracting Stem, Martis Split Stem (Gatecliff series), Steamboat</td></tr>
<tr><td>Early Archaic Period</td></tr>
<tr><td rowspan="4">Lithic Stage</td><td rowspan="3">Pre-Archaic Period</td><td>8000</td><td>Spooner Phase</td><td>?</td><td>Probably Martis Contracting Stem</td></tr>
<tr><td>10000</td><td>Tahoe Reach Phase</td><td rowspan="2">?</td><td>Great Basin Stemmed series</td></tr>
<tr><td>Fluted Point Period</td><td>11500</td><td>Washoe Lake Phase</td><td>Fluted</td></tr>
</table>

Notes: * Based on Elston 1986; Elston et al. 1994; Elston et al. 1995a.
** Based on Lindström et al. 2002: Table 7

The Early Archaic Period (ca. 7000 to 4000 BP) begins with a Middle Holocene warming trend, during which lakes and marshes receded, and drought tolerant vegetation communities expand. Elston et al. (1995b) predict that, as warming causes resource distributions to constrict, human subsistence strategies should become more logistical. Diet breadth should begin to increase, probably with the incorporation of more plant resources, and residential sites should be tethered to reliable water. Drying lowlands may have prompted people to travel into upland resource zones like the Tahoe Sierra where, in addition to hunting, prehistoric economies also incorporated seed processing and fishing. Unfortunately, archaeological sites dated to the Early Archaic are rare, and populations probably were small (Elston 1986). No diagnostic projectile point types have been identified for most of the Early Archaic Spooner Phase (Elston et al. 1995a). It isn't until near the end of this period, ca. 5000 BP, that the Martis Contracting Stem and Martis Split Stem atlatl dart points were thought to have appeared, although more recent research suggests that contracting stem forms were used throughout Early Archaic times (Milliken and Hildebrandt 1997; see discussion in *Research Design, Chronology* on page 24). These two points are considered equivalent to contracting stem and split stem points of the Gatecliff series (Elston et al. 1995a).

Late Holocene archaeology, beginning with the later Early Archaic, is better known, and Late Holocene chronologies are well developed (Elston et al. 1995a; Grayson 1993). The Martis Contracting Stem and Martis Split Stem projectile points represent a late aspect of the Early Archaic, but continue in the archaeological record, through the Early Martis Phase, to 3000 BP. Most of the archaeological sites in the western Great Basin date to the Late Holocene, suggesting that populations were increasing. Increased site numbers are also probably due, in part, to better preservation. Late Holocene climate, after ca. 4000 BP, saw a trend toward cooling and increased moisture (Lindström and Bloomer 1994). The Early Archaic at this time is characterized by diversified land use, with large sites located near permanent water. Big game hunting continued, but with intensified seed processing and storage (Elston 1986).

The Middle Archaic Period begins at about 4,000 years ago, during the Early Martis Phase, and continues through the Late Martis Phase to ca. 1300 BP (Elston et al. 1995a). The Martis Contracting Stem and Martis Split Stem points reflect an early aspect of the Middle Archaic, but Martis Corner-notched projectile points (ca. 3000–1300 BP) are the predominant Middle Archaic time marker. The environment at this time would have been predominantly cool and wet, becoming warmer and drier by about 1,500 years ago (Lindström and Bloomer 1994). With a return to more optimal living conditions, population densities increased. More intensive prehistoric use of the Tahoe Sierra began during this period, as mixed mode foragers-collectors ventured into the highlands on seasonal gathering, fishing and hunting forays. Elston (1986) notes that the Early/Middle Archaic transition was gradual, probably marked by changes in settlement and subsistence practices. He points to consistent site reoccupation as an indicator of a developing settlement strategy, and further notes that the nature of the residential sites and the occurrence of specialized cache sites, "suggest that some groups regularly exploited a limited territory" (Elston 1986:142). Big game hunting was still important, but resource diversification probably included an increase in the use of small mammals. A hallmark of Middle Archaic prehistoric culture in the Tahoe Sierra is the increased use of basalt in the manufacture of stone tools. In the north-central Sierran region, the "lithic landscape" is marked by at least 17 distinct basalt flows that were

the focus of prehistoric quarrying activities. At this time, lithic technology became focused on the production of large bifaces, using toolstone procured from large quarries such as Alder Hill (McGuire et al. 2006) north of Truckee, Watson Creek on Tahoe's north shore (Bloomer et al. 1997) and Sawtooth Ridge along the Tahoe Reach of the Truckee River.

The Late Archaic period, about 1,300 years ago to historic contact, has been equated with the ethnographic Washoe, a distinct Native American culture described in ethnographic accounts written by early anthropologists. This period is marked by an overall drying trend, punctuated by cool-moist episodes alternating with extended severe drought that lasted until about 500 years ago. Such extreme climatic fluctuations may have allowed for year-round residence on Donner Creek at some times and prohibited even seasonal occupation at other times. The early half of this period (Early Kings Beach period; ca. 1300–700 BP) is marked by Rose Spring series arrow points, the later half (Late Kings Beach period; ca. 700–150 BP) by Desert Side-notched and Cottonwood arrow points. Bow and arrow technology replaced the atlatl and dart during the Late Archaic. At the same time, the Middle Archaic production of large bifaces was replaced by an emphasis on a core/flake technology and the use of simple flake tools. Resource diversification continued to increase, with greater emphasis on plants and small game.

WASHOE LAND USE

Washoe land-use strategies are ethnographic patterns that represent the latest manifestation of prehistoric Tahoe Sierra land use. Subsistence and settlement patterns were documented by Anthropologists (Downs 1966; Freed 1966; Price 1980) during a relatively short historic period of fluctuating paleoclimate and European intrusion that probably altered the course of Washoe activities. Therefore, Washoe land use is viewed not as analogy to the past, but as a guide for looking at prehistoric land use in light of paleoclimatic history and subsistence adaptation. Several recent research reports offer extensive treatments of Washoe ethnography and history, subsistence and land use (Lindström et al. 2002; Lindström et al. 2000; Lindström, in Bloomer et al. 1997:III-11-23; Lindström 1992; Rucks 1996). The following discussion is a brief overview.

Washoe land use is best characterized as generally following a "seasonal cycle of procurement" (d'Azevedo 1986:472) where temporary subsistence camps were located across the Tahoe Sierra to take advantage of available plant and animal resources throughout the year. The general tendency was to move from low elevation winter villages to high elevation summer villages and back again, but not everyone moved from their villages. The degree and duration of movement depended on seasonal resource abundance. Tahoe villages might have seen year-round occupation during warm/dry winters and gone unoccupied during summers when resources were scarce (Lindström and Bloomer 1994:28). In fact, d'Azevedo (1956:54) reports year-round occupation of a large habitation site near the confluence of Donner Creek with the Truckee River. This flexibility in subsistence transhumance translates to Washoe seasonal use, as well as periodic year-round occupation, of Donner Creek by various size groups and was probably characteristic of Donner Creek settlement throughout prehistory.

Hunting deer and mountain sheep was often done by one or two individuals with bow and arrows (d'Azevedo 1986:477–479). Small groups of hunters in pursuit of herds constructed hunting blinds with rock, poles and brush. Large group hunts were organized to

drive deer and antelope herds towards waiting hunters or into corrals where they were shot. Prior to the advent of bow and arrow technology, about 1,300 years ago, atlatls (throwing sticks) were used to throw darts fitted to long shafts. Large drives were also used to hunt rabbits, driving hundreds of animals into long nets. Other small mammals, such as porcupine, beaver, badger, marmots and squirrels were shot or trapped. Mice, rats, gophers and moles were also taken. Most birds were eaten, but reptiles were not.

Fish were a predictable and consistent year-round Washoe resource (d'Azevedo 1986; Lindström 1992). Tahoe and its tributaries flow from spring through summer, and spring and fall trout runs along the Truckee River were prime Tahoe Sierra fisheries (d'Azevedo 1986:473). Seasonal trout runs extended up Donner Creek to Donner Lake when water levels were adequate. Dried fish were transported to winter villages and could have been transported to seasonal camps at higher elevations where fish were not available.

Gathering plants for food, medicinal use and raw material for many manufactured items was an intensive effort from spring through fall (d'Azevedo 1986:473–477). Fresh greens are typically abundant in the spring. Roots, bulbs and seeds are harvestable during summer, while pine nuts were the most abundant and valuable local plant resource in the fall. Acorns were also a valuable fall resource, but had to be gathered by trekking west over the Sierra crest to oak groves on the western slopes. Therefore, acorns were not a staple for the most distant Washoe groups, but were probably available to Donner Creek residents. Insects, worms, larvae and honey were also collected.

Washoe place names are common throughout the Donner/Truckee area (d'Azevedo 1956). Donner Lake was called *datsasut* and the Truckee River is *awakhu wata*. The year-round village near where Donner Creek meets the Truckee River is *dasasut malam detdeyi*. A large village at Truckee is known as *kubuna detdeyi*.

EURO-AMERICAN LAND USE

Euro-American land use in the vicinity of Donner Creek has been extensive from the mid-1800s up to present day. The discussion here is brief, serving to set the context for envisioning Washoe interactions with Euro-American immigrants. More complete treatments of Donner Memorial State Park history are found in Hardesty 1985, Lindström 1986, Nesbitt 1990, and Woodward 2001.

In 1844 the Stevens-Murphy-Townsend Party established the Truckee River Route of the Overland Emigrant Trail just 150 meters north of the project area along the present day Donner Pass Road. Two years later, members of the Donner Party were trapped by deep winter snow and made camp on Donner Creek, 400 meters east of Locus F/G. The 1864 Dutch Flat/Donner Lake Wagon Road and the 1868 transcontinental Central Pacific Railroad followed the early emigrant route, facilitating the steady settlement and development of Donner Lake and the town of Truckee. Donner Pass Road, also known as the Lincoln Highway (1913), the Victory Highway (1920s) and US Route 40 (1928), has always been a major transportation route.

Historic development and industries around Donner Lake included logging, ice making, fishing and tourism. The outlet of Donner Lake has been altered by historic-era activities since the mid-1800s. Early dams were constructed along the lake's outlet drainage, taking advantage of prominent ridges and constrictions (glacial moraines), to provide irrigation water for power saw mills, and provide storage areas for ice production. Water

reclamation was facilitated in 1889 by construction of the dam at Donner Lake's outlet, raising the lake level six feet (Lindström and Marvin 2004). The current dam and bridge were constructed in 1927 to increase water storage as part of the Newlands Project, raising the lake level about 12 feet above its natural level. The lake still contributes water to irrigation and domestic supplies, but its primary use is recreation.

The Pioneer Monument, within Locus A, was completed in 1918 to honor the 1840s California emigrants. Donner Memorial State Park was established at the monument and added to the park system by 1928 (Nesbitt 1990). The park was expanded to include the eastern shores of Donner Lake in 1948, incorporating all of CA-NEV-13/H. The park's Emigrant Trail Museum opened in 1962.

Chapter 3: Previous Archaeology

Previous archaeological studies conducted at CA-NEV-13/H are the foundation of current investigations and provide a local context for interpreting new finds within the site. On a larger scale, previous archaeological studies in the Donner Lake vicinity and beyond set the archaeological and prehistoric contexts for regional interpretations.

CA-NEV-13/H

Site CA-NEV-13/H has a long and varied history of archaeological investigations. As early as 1952, the prehistoric lithic scatter at Locus G was originally recorded as CA-NEV-12 by Elsasser and the Locus A lithic scatter was recorded as CA-NEV-13 by Barker and Pilling (Schwaderer et al. 1987; Schwaderer 1988). Archaeological investigations languished after these initial recordings until Riddell visited the site in 1980 to update the CA-NEV-13/H site record, incorporating the historic Chinese component at Locus E. In addition, Riddell excavated two 2-square-foot excavation units south of Locus E to test the archaeological deposit in conjunction with development of the current park entrance station. Riddell's notes (1980) record two basalt scrapers, 36 basalt flakes, two silicate flakes and two obsidian flakes recovered from 0 to 36 inches below surface. Numerous Chinese ceramic fragments, glass and metal were also recovered.

The 1980s was a time of several archaeological studies at Donner State Park. In 1984, Hardesty (1985; Lindström 1986) excavated the historic Murphy Cabin at Locus C. After the excavations, the Murphy Cabin and a prehistoric lithic scatter were formally recorded as CA-NEV-540/H (Hines 1986). A year later, the three sites (CA-NEV-12, 13/H, and 540/H) were combined to make one large site designated as CA-NEV-13/H (Schwaderer et al. 1987). Nesbitt's (1990) review of *The Cultural Resources of Donner Memorial State Park* provides a synthetic history and overview of CA-NEV-13/H archaeology up to that time.

Archaeology within Donner Memorial State Park was uneventful throughout the 1990s until near the turn of the twentieth century. In 2001, State Parks Sierra District archaeologists conducted an intensive reconnaissance of the park to update the CA-NEV-13/H site record, redefine locus and site boundaries and record Global Positioning System (GPS) data for the primary features and boundaries within the site area (Gilbert et al. 2001). In addition, seven shovel probes and one 50-x-50-centimeter excavation unit were dug west of Locus B and C in conjunction with small

park maintenance projects (Gilbert et al. 2001). Prehistoric artifacts recovered include a basalt Rose Spring projectile point, an obsidian scraper, 15 basalt flakes, five obsidian flakes and one CCS flake. Additional survey north of Donner Creek with another site record update (Brooke 2005) was conducted from 2004 to 2005 in conjunction with the proposed development of a new High Sierra Crossings Museum (Bloomer et al. 2006). The test investigation for the proposed High Sierra Crossings Museum, located in the vicinity of the current Emigrant Trail Museum, was conducted in 2006 (Bloomer et al. 2007). Excavation results indicate the prehistoric and historic deposits between loci in the northeastern site area are generally characterized by low artifact density and low artifact diversity.

Additional recent investigations include the archaeological test excavations conducted by Sierra District archaeologists at Locus B to investigate the archaeological deposit in an area of planned disturbance (Green and Solis 2005; Jaffke 2006). The recovered prehistoric artifact assemblage from three 1-x-1-meter test units includes three basalt bifaces, nearly 200 basalt flakes, two obsidian flakes and two CCS flakes to 70 centimeters deep. A test investigation was also conducted by Sierra District archaeologists at Locus F/G in conjunction with the Truckee Meadows Water Authority (TMWA) improvement upgrade of Donner Dam (Jaffke 2005). The test investigation led to a data recovery investigation conducted by Bloomer and Lindström (2006a). The results of the Locus F/G investigations are summarized in the Introduction, Locus F/G description.

DONNER LAKE VICINITY

Archaeological investigations at two prehistoric sites (CA-NEV-199 and -9) on Donner Creek, east of CA-NEV-13/H (Figure 5), were conducted from 1977 to 1983. Investigations of two other prehistoric sites (CA-NEV-529 and -530/H), at the west end of Donner Lake (Figure 5), were conducted in 1988 and 1989. The artifact collections from subsurface excavations at each site provide relevant comparative data from the Donner Lake vicinity.

Site CA-NEV-199 was located on a small rise above the north bank of Donner Creek, about one mile east of Donner Lake. A large portion of the site was probably removed during the 1960s construction of Highway 80 (Rondeau 1982). Test excavations were conducted in 1977 on a remnant of the site north of the highway in conjunction with the expansion of the California Agricultural Inspection Station (Keesling and Johnson 1978). Additional data recovery excavations were conducted in 1980 to mitigate construction impacts (Rondeau 1982). Results of both the test and data recovery investigations uncovered an artifact rich deposit from 50 to more than 100 centimeters deep, suggesting probably seasonal and long-term site habitation. The artifact assemblage is predominantly basalt with lesser frequencies of obsidian and CCS toolstone. Projectile points, bifaces and debitage are abundant in the collection, representing a predominance of basalt biface reduction in tool manufacture and maintenance. A large number of well made scrapers were also recovered. The groundstone collection includes both *gamum* (handstone) and *itdemge* (milling slab). Chronologically diagnostic projectile points and obsidian hydration data indicate initial occupations before 7000 BP with primary occupations from 5000 to 1300 BP, continuing to probably 700 years before Euro-American contact.

Site CA-NEV-9 was located on the south side of Donner Creek in a developing commercial zone along Highway 89, approximately half-a-mile from the confluence of Donner Creek with the Truckee River. Test excavations were conducted in 1983 on a remnant

portion of relatively undisturbed site area in conjunction with the construction of a McDonald's Restaurant (Lindström 1983). The collected artifact assemblage, like that from CA-NEV-199, is composed primarily of basalt bifacial tools and debitage. Unlike CA-NEV-199, the CA-NEV-9 artifact quantities are low and there are no groundstone tools. The

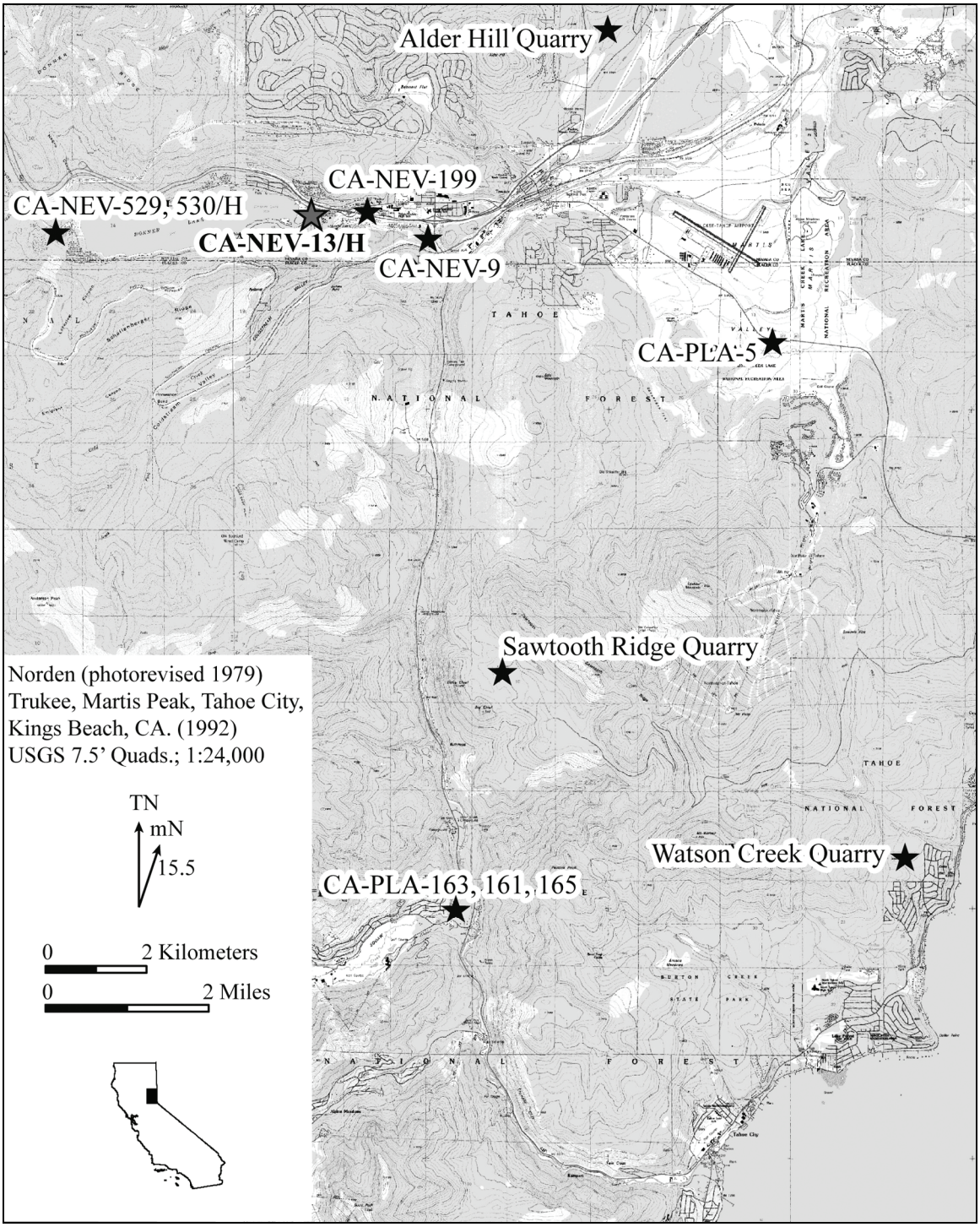

Figure 5. Select Regional Archaeological Sites.

maximum depth of the archaeological deposit was 80 centimeters below surface. Although short term habitation may have occurred here, the predominance of basalt bifaces and debitage with a lack of groundstone suggests basalt bifacial tool manufacture was the primarily activity. Chronological data derived from four large Martis Corner-notched and Martis Contracting Stem projectile points indicates primary occupations from 5000 to 1300 BP.

Sites CA-NEV-529 and -530/H are relatively small sites on the north side of Summit Creek, approximately one-quarter-mile west of Donner Lake. Test excavations conducted in conjunction with a housing development recovered a rich and varied flaked stone assemblage from CA-NEV-529, indicating a wide range of activities were conducted during habitation (Lindström 1990). Archaeological deposits here ranged from 30 centimeters on bedrock to 80 centimeters in a saddle between high points. Although only one Rose Spring projectile point was recovered, representing one period of occupation at CA-NEV-529 from 1300 to 700 BP; obsidian hydration data reflect an ancient and sporadic occupational history. Hydration data clustering from 7.4 to 6.0 microns indicate occupations before 7000 BP, while a second data cluster from 4.7 to 3.7 microns represents occupations from probably 4000–2500 BP. The artifact assemblage from the 40 centimeters deep deposit at CA-NEV-530/H is much smaller, reflecting infrequent use, probably by CA-NEV-529 residents. One basalt Martis Contracting Stem projectile point indicates site use from 5000 to 3000 BP.

REGIONAL ARCHAEOLOGY

Beyond Donner Lake there have been numerous important investigations of prehistoric archaeological sites. Two large probably intermittently year-round village sites (CA-PLA-5, and CA-PLA-163 through CA-NEV-165) and three basalt quarries (Alder Hill, Sawtooth Ridge and Watson Creek) are highlighted here for comparisons with CA-NEV-13/H site data (see Figure 5). Otherwise, the *Archaeology of the Tahoe Reach of the Truckee River* (Elston et al. 1977) identifies multiple sites with representative photographs and basic discussions of the regionally characteristic basalt assemblages. More recently, a *Contextual Background for the Lake Tahoe Outlet* (Lindström et al. 2002) presents a comprehensive discussion of the current prehistoric research design for the Tahoe Sierra.

Site CA-PLA-5 is a long and narrow high density basalt lithic scatter situated on a flat terrace overlooking the confluence of several branches of Martis Creek in the center of Martis Valley. Extensive surface and subsurface investigations were conducted in 1996 in conjunction with a Southwest Gas Corporation pipeline construction project along the shoulder of Highway 267 (Ataman et al. 1999). The archaeological deposit here is typically shallow, at less than 60 centimeters deep; but the artifact assemblage is rich with abundant projectile points, bifaces, flake tools and groundstone. Massive amounts of basalt debitage represent a focus on basalt tool manufacture. In addition, a rock lined hearth was found at 20 centimeters below surface and fire cracked rock scatters represent the presence of other hearths. Chronologically diagnostic projectile points and obsidian hydration data indicate site occupations spanned most of Tahoe Sierra prehistory from initial occupations before 7000 BP to about 500 BP.

Sites CA-PLA-163, -164, and -165 are collectively known as the Squaw Valley sites, set at the mouth of Squaw Valley on the south terrace above Squaw Creek. Test and data recovery excavations were conducted at these sites in 1999 in conjunction with a

housing development project (Bloomer and Lindström 2006b). Although each site is not exceptionally large in area, collectively they make a complex of rich habitation sites probably concurrently occupied. Site deposits predominantly ranged from 40 to 100 centimeters deep. Like CA-PLA-5, the artifact assemblage is primarily basalt with abundant projectile points, bifacial tools and debitage reflecting tool manufacture. Groundstone is also common in the assemblage, including many *lam* (Washoe word for bedrock milling feature) on granite boulders. Four subsurface hearths were discovered at two of the sites with 14C ages ranging from 2860 to 500 BP. Projectile points and hydration data represent site occupations beginning about 7000 BP and ending not long after 700 BP, with an occupational peak between 2800 and 1800 BP.

Regional basalt quarries of primary interest include Alder Hill, Sawtooth Ridge and Watson Creek (see Figure 5). The basalt at each of these sources has a distinct geochemical signature read by X-ray fluorescence (XRF) trace-element analysis. In addition, the archaeologically recorded distribution of Alder Hill basalt artifacts is different from the archaeological distributions of Sawtooth Ridge and Watson Creek basalt artifacts (Bloomer et al. 1997). Investigations at the Alder Hill Quarry have recorded only a portion of the prehistorically extensive quarry deposits (Lindström 2000). Recent excavations at the larger loci within the quarry indicate initial occupations and quarrying during the Early Holocene (McGuire et al. 2006). Test investigations at the Watson Creek Quarry (Bloomer et al. 1997) recorded residential and reduction loci as part of a US Forest Service, Lake Tahoe Basin Management Unit (LTBMU) forest management project (Lindström and Waechter 1996). The Sawtooth Ridge Quarry is probably extensive, but unfortunately is not well recorded. In fact, basalt cobbles with a geochemical signature matching Sawtooth Ridge have been reported from natural cobble deposits at CA-PLA-718/H along the shore near Tahoe's outlet into the Truckee River (Bloomer et al. 2002).

Chapter 4: Tahoe Sierra Prehistoric Research Design

The Tahoe Sierra prehistoric research design has developed over many years as a result of numerous investigations that have contributed to archaeological knowledge about regional prehistory. The research design provided for this project represents the most current framework that drives our data collection and interpretations of prehistoric resources. The research design provides a complete context for investigations, with appropriate modifications, to relate to Donner Lake prehistory and geography within the larger Tahoe Sierra.

Prehistoric archaeologists are concerned with human behavior, specifically the development of human behavior throughout prehistory. What we have learned about prehistory has shown us that human populations have altered their life-ways and land-use strategies through time, and that there were probably correlations between paleoenvironmental change and changes in human behavior. It was also probably true that demographic constraints, as well as social and political pressures influenced the courses of prehistory. However, because archaeology deals primarily with data sets derived from ancient material objects such as stone tools, the patterns that appear to reflect environmental or resource opportunities and constraints, and their concomitant human responses (site location, diversity in tool assemblages and the composition of food remains), are the most easily observed and, therefore, occupy a large part of archaeological inquiry.

It is appropriate then, that our knowledge is modeled in terms of land-use adaptive strategies (i.e., settlement and subsistence) and technological organization of tool kits within the overarching organizer of time. If not for chronology, we would have little order for developing archaeological ideas about the development of prehistoric culture. The major body of archaeological research currently practiced in the Tahoe Sierra and western Great Basin works with these assumptions to explain prehistoric human behavior, whether couched in an appropriate blend of middle range theory with optimal foraging theory (Elston et al. 1994, 1995a; Lindström 1992; Moore and Burke 1992; Zeier and Elston 1986), or more strict interpretations of evolutionary ecology (Zeanah et al. 1995).

In essence, the archaeological record is viewed as largely a reflection of human adaptation to environmental, as well as cultural influences, and that the organization of human behavior was not static, but fluid. Archaeological

sites like those at Donner Lake represent repeated occupations, possibly year-round, as well as in different seasons for different purposes over a long and relatively continuous span of time. Therefore, we place a high value on the spatial and temporal associations of archaeological phenomena as primary analytical components for archaeological interpretation. Consequently, the effects of geomorphological processes on site formation weigh large in decisions of component organization and interpretations of site structure.

Research issues developed to guide archaeological investigations at Donner Lake stem from these basic theoretical underpinnings and offer informative contexts for archaeological interpretation. The issues are paleoenvironment, chronology, land use, lithic technology and toolstone procurement.

PALEOENVIRONMENT

Paleoenvironmental research through the analysis of archaeological assemblages is essentially an investigation of cultural and environmental associations (Lindström and Bloomer 1994). Donner Lake is a moderate elevation riparian forest environment, a rich environment where snow can cover the ground all winter, but the spring, summer and fall are warm and teaming with plant and animal resources. Occupation was possibly year-round, as well as seasonal, with environmental fluctuations affecting the availability of resources and the duration of site use.

The approach for addressing paleoenvironmental research issues during archaeological investigations at Donner Lake focuses primarily on geomorphology to interpret soil and site formation within the forest environment, to provide insights into spatial contexts for interpreting artifact associations and site structure. Geomorphic studies take into account models of general climatic conditions applied to the forest sediments during periods of occupation. In addition, we hope to find faunal and botanical remains reflecting the available plant and animal resources and, therefore, the seasons of occupation. Unfortunately, we have found that the preservation of faunal and botanical remains is typically poor in forest soils.

CHRONOLOGY

Archaeological inquiry must be placed within the framework of time. To that end, archaeologists have developed an evolving taxonomic chronology for Tahoe Sierran prehistory (see Table 1). It is evolving because radiocarbon date associations are few, but accumulating, while pattern variations and inconsistencies have appeared as we continue to work with projectile points and obsidian hydration data considered indicative of time. In an effort to contribute to rigorous chronology building, a high research priority is placed on single component deposits. Single components might be single task specific locales, or limited occupation episodes isolated from or within multi-component sites, or more developed long term occupation deposits that can be temporally nested within a specific chronologic period or phase.

A focal issue concerns the scarcity of Pre-Archaic and Early Archaic archaeological remains. Even though these early populations were probably small and a low density archaeological record is expected, prehistoric chronological data gathered from Tahoe Sierran sites increasingly indicate that initial occupations predate the Middle Archaic, before 5,000 years ago. Pre-Archaic populations were probably present in the Tahoe Sierra by about 9,000

years ago and resources would have been plentiful. The low visibility of early culture in the Tahoe Sierra may be partly attributed to natural processes such as erosion and deposition, which may obscure early archaeological remains. On the other hand, it is likely that diagnostic artifacts have been temporally misinterpreted and that developing obsidian hydration data sets are just beginning to adequately represent the earliest temporal associations.

Types of chronological information available at archaeological sites throughout the Tahoe Sierra include obsidian for hydration analysis and time diagnostic artifacts. Charcoal bearing hearths and ovens are less common, but are beginning to be discovered with increasing frequency.

Chronological research issues for Donner Lake sites and most other sites in the Tahoe Sierra concern general occupational history, while attempting to distinguish single temporal components in the deposit. The occupational histories are compared to other sites in the Donner Lake area and to the cultural patterns and taxonomic chronology proposed for the Tahoe Sierra and the eastern front. Methodologically, temporal interpretations of obsidian hydration data are compared to chronological interpretations based on the projectile point types to better calibrate both data sets as temporal indicators.

Radiocarbon 14C Dating

Carbon samples associated with interpretable archaeological contexts are hard to collect in Tahoe environments because of ground turbation and poor preservation. Charcoal samples in feature contexts are most reliable for determining the age of depositional strata and associated artifact assemblages. Fortunately, recent archaeological investigations near the mouth of Squaw Valley at site CA-PLA-165 recorded several radiocarbon dates from three Middle Archaic subsurface hearths and ovens (Bloomer and Lindström 2006b); thereby, pointing up the real potential for uncovering chronologically significant subsurface features. Also, extensive excavations in Martis Valley at CA-PLA-5 and CA-PLA-6 recorded 19 14C dates, but only one was from a subsurface hearth feature context (Ataman et al. 1999). All others were charcoal samples from excavated unit strata, sediment samples and backhoe trench sediments. Nevertheless, dates from the unit strata facilitated chronological interpretations of site occupations.

Obsidian Hydration

Obsidian hydration data have the potential to date artifacts, archaeological strata and sites. However, before hydration data can be used to achieve chronological objectives, it is necessary to recognize and account for the variables that can affect the patterning of hydration data (i.e., sampling strategies, environmental variables, technological variables and the application of hydration rate formulae, projectile point chronology and post-depositional processes).

Obsidian hydration and projectile point types are routinely interpreted as chronological indicators. In the past few years, hydration data for time sensitive projectile points have been compiled for distinct north Sierran regions and single component archaeological sites. These data compilations serve as foundations for temporal interpretations, but have also indicated potential problems with current temporal interpretations of projectile points and/or hydration data (Bloomer 1993; Bloomer et al. 1997).

Hydration data are interpreted in the Tahoe region by comparison with three previously developed data sets from three separate north Sierran research areas, incorporating data from multiple sites (Table 2). The most recent study comes from Bagley Valley, south of Markleeville, California (Ataman et al. 2001). Hydration data for Bagley Valley projectile points representing specific temporal periods were combined irrespective of source to calculate hydration means for phases of the Eastern Sierra Front Chronology. A similar method was followed in an earlier compilation of Bodie Hills source projectile point hydration data from numerous north Sierran sites and isolate locations (Bloomer 1993; Bloomer et al. 1997). These data were reevaluated, updated and modified slightly for recent Tahoe Outlet investigations (Bloomer et al. 2002). The third data set consists of debitage rim measurements from a single Pre-Archaic age component at LTBMU Site 05-19-795, South Lake Tahoe, California (Martin 1998).

Data means for each chronological period provide a relative distinction between the two Late Archaic Kings Beach periods. Data means also distinguish the Late Archaic Kings Beach period from Middle Archaic Martis periods. On the other hand, distinctions within Middle Archaic Martis periods are not well defined. In fact, overlaps in Late Martis and Early Martis projectile point hydration ranges are typical within Tahoe Sierra data sets (Table 2). This problem has been discussed in conjunction with other recent investigations (Bloomer et al. 1997:II-41). Basically, the overlap suggests that dart size contracting stem and corner-notched projectile points have no temporal distinction in the northern Sierra. Or, that obsidian hydration is not consistent in rim formation (e.g., hydration might stop for some artifacts and never start again).

Fortunately, FS 05-19-795 hydration data provides a good foundation for expected Tahoe Sierra Pre-Archaic hydration rim values at greater than 7.0 microns, while Late Archaic hydration data is relatively consistent at less than 2.5 microns.[1] Given both ends of the spectrum, the 7.0 and 2.5 micron data points are used as anchors to create a hypothetical hydration rate curve (Figure 6) for the chronological interpretation of hydration rim values. The hydration data sets in Table 2 provide an analytical perspective and the hydration rate curve is an analytical tool that we can use to interpret Tahoe Sierra and Donner Lake hydration data.

Table 2. Obsidian Hydration Chronology – Three Data Sets [Range μ] mean μ, SD μ.

EASTERN SIERRA FRONT CHRONOLOGY	WASHOE LAKE	TAHOE REACH	SPOONER	EARLY MARTIS	LATE MARTIS	EARLY KINGS BEACH	LATE KINGS BEACH
Northern Sierra (Bloomer et al. 1997)	no data	[3.1]	no data	[1.2-4.0] **2.8**, 0.9	[0.9-5.6] **2.8**, 1.3	[1.1-2.5] **1.8**, 0.6	[0.8-2.0] **1.3**, 0.3
Bagley Valley (Ataman et al. 2001)	no data	no data	no data	[2.6-5.7] **4.1**, 1.1	[1.1-7.1] **3.9**, 1.5	[1.2-3.7] **2.5**, 0.7	[0.8-4.1] **1.9**, 0.9
FS 05-19-795 (Martin 1998)	no data	[6.0-8.7] **7.0**, 0.8	no data	no data	no data	no data	no data

[1] An updated (November 2010) analysis of 32 Rose Spring series projectile points from the Tahoe Sierra returned a 2.2 micron mean - interpreted at approximately 1000 BP on the hydration curve.

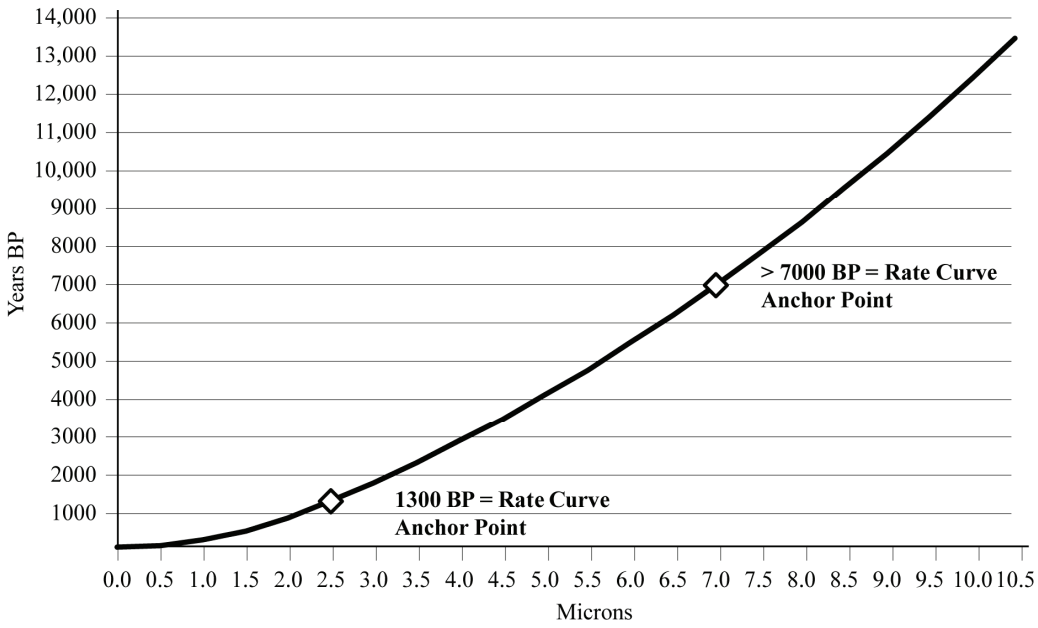

Figure 6. Hypothetical Obsidian Hydration Rate Curve for the Tahoe Sierra.

Time Diagnostic Artifacts

Single artifact types and cultural material assemblages have varied typologically, stylistically and/or functionally over time. Unique combinations of these artifact classes characterize certain time periods. Flaked stone tools are ubiquitous in Tahoe Sierran archaeological contexts and are therefore the focus for assemblage comparisons. Moore and Burke, in their 1992 Truckee Meadows study, characterized Middle Archaic Martis assemblages as composed of dart size stemmed, notched and leaf shaped projectile points in the Martis and Elko series, large bifaces, relatively large flake tools, perforators and gravers. Late Archaic Early Kings Beach phase assemblages are composed of arrow size stemmed and notched projectile points in the Gunther and Rosegate series, and large and small triangular bifaces, while flake tools and perforators are rare. The Late Kings Beach phase of the Late Archaic is characterized by notched and unnotched arrow size Desert series points, two distinct kinds of small bifaces, as well as rare occurrences of flake tools and perforators that are similar to Early Kings Beach kinds. Moore and Burke (1992) describe each of these assemblages and the important distinctions in tool manufacture technology in detail. Subsequent Truckee Meadows (Elston et al. 1994, 1995a) and Martis Valley research (Ataman et al. 1999) has reiterated these assemblage characteristics, pointing up the fact that flaked stone tool assemblages comprise time diagnostic tool kits. Tool kits changed through time with shifts in subsistence, technological innovation and evolving land-use strategies.

Within flaked stone assemblages, projectile point types are the primary time diagnostic artifacts driving chronological interpretation. More than 30 years ago, Elston, in his *A Contribution to Washo Archaeology* (1971), applied well-dated named western Great Basin projectile point types (Clewlow 1967; Lanning 1963; O'Connell 1967) to provide chronological analogs for morphologically similar large basalt Sierran projectile points first described by Heizer and Elsasser (1953; Elsasser 1960). Several Martis point types were

defined to incorporate Heizer and Elsasser's (1953; Elsasser 1960) previously unnamed types that were indicative of the Middle Archaic "Martis Complex." Over the years, Martis types and their use as chronological indicators have undergone periodic revision based on research along the upper reach of the Truckee River (Elston et al. 1977) and along the eastern Sierran front (Elston et al. 1994, 1995a). To date, the Martis series includes large corner-notched points, large side-notched points, a large contracting stem and a split stem form (Elston et al. 1994, 1995a).

The western Great Basin and Martis point types have been used ever since as chronological time markers within the Tahoe Sierra (Ataman et al. 1999; Bloomer et al. 1997; Bloomer et al. 2002; Cleland 1988; Elston 1982; Elston et al. 1977, 1994; Lindström and Bloomer 1994; Zeier and Elston 1986, 1992). The projectile point types and chronological framework applied today are generally similar to past schemes, but have evolved to become the Eastern Sierra Front Chronology (see Table 1; Elston et al. 1994, 1995a).

The title, *Eastern Sierra Front Chronology*, highlights the fact that this temporal scheme is primarily applicable to the eastern Sierra. It has proven useful in application from the valley floors of the Truckee Meadows in Nevada, west and up to the Tahoe region. It is also applicable over the crest on the western Sierran slope to about the 6,000 foot contour. Below there on the western front, projectile point morphologies change and the applicability of the Eastern Sierran Front Chronology diminishes.

For many years researchers working in the western Sierran foothills have called for abandonment of the western Great Basin and Martis point types (Markley 1982; Clewlow et al. 1984; Jackson et al. 1994a; Jackson and Ballard 1999). This is because the Sierran projectile point key (Leventhal 1977; Zeier and Elston 1986), used to distinguish the temporally diagnostic named types, does not fit west side projectile point morphology as well as it should. Throughout the 1970s and 1980s the western researchers had little alternative to the Sierran key and chronological scheme. More recently, Jackson et al. (1994a) have developed a western Sierran descriptive typology to fit into their North Central Sierra Chronology and applied it to studies of the American River Watershed cultural chronology (Jackson and Ballard 1999). The North Central Sierra Chronology is a needed alternative for western Sierran archaeology, leaving the Eastern Sierra Front Chronology to the Tahoe Sierra and eastern Sierra front.

Martis and Elko Series Projectile Points

The application of certain projectile point types in the Tahoe region and across the eastern Sierra front is also undergoing critical review. One of the main issues is the use of Martis and Elko series classifications for large notched projectile points that have essentially the same morphology and age. These point types have been kept distinct to maintain the Elko series connection with Great Basin chronology, as well as the potential for analyzing point type distributions as an indicator of regional interaction and influence.

The Martis series is considered to be the regional Tahoe Sierra analog of the western Great Basin Elko series (Elston et al. 1994). But in the Sierran projectile point key, Elko Corner-notched points are distinguished from Martis Corner-notched by only one dimension, a distal shoulder angle (DSA) less than 195 degrees (Leventhal 1977). The actual visible morphological distinction between Elko and Martis is obscure and DSA measurements on a single point can indicate Elko for one shoulder and Martis for the opposite shoulder. Recent research suggests the DSA distinction has little or no interpretive value, other than to assess

the technological constraints of flake blank selection. For example, thick basalt blanks may be harder to notch and so end up as Martis series, while thin blanks are more readily notched to Elko forms (Ataman et al. 1999:6-30–6-33). The results of basalt projectile point replications have also indicated that thin flake blanks are easier to notch, and would therefore be more likely to be made into Elko forms (Edwards 2000).

The implication is that basalt Martis and Elko projectile points are essentially the same and should be classified together as either Martis or Elko series because their morphology reflects the technological constraint of basalt flake blank thickness and not the cultural influence of desired form. Yet, flake blank selection is a behavior that may be regionally variable. Also, there is evidence of distributional variability in basalt point morphology between the Tahoe Sierra and the low elevation valleys on the eastern Sierra front, even if only based on DSA angles. A review of large basalt corner-notched projectile point morphology reported for assemblages from sites along the Highway 395 corridor (Elston 1979) shows that large basalt flake blanks were predominantly made into Elko points. In the Truckee Meadows the numbers of basalt Martis Corner-notched and basalt Elko Corner-notched points are nearly equal, but Elko Corner-notched points, including all toolstones, are slightly more common (Moore 1992; Zeier and Elston 1986). In contrast, Martis forms are much more numerous than are Elko forms for large collections from the Tahoe Sierra (Ataman et al. 1999; Bloomer and Lindström 2006b; Elston et al. 1977). Therefore, even if flake blank thickness is the determinate morphological variable in the manufacture of large basalt Martis projectile point forms, the Martis series appears to reflect regional identity.

Most important, because the Martis Corner-notched is the primary projectile point type representing Middle Archaic occupations throughout the Tahoe Sierra, it is considered most distinctive of the Middle Archaic Period–Late Martis phase in this region. The Elko series has outlived its past usefulness as the initial temporal link between Martis series projectile points and the regional chronology. Yet, Elko is retained as a heuristic point type classification to represent western Great Basin regional influence for distributional analysis of Tahoe Sierran regional interaction spheres.

The Martis series also includes contracting stem forms representing the morphological projectile point variability evident within the Middle Archaic–Early Martis phase assemblages, while the Elko series in Sierran assemblages no longer includes contracting stem forms. Dart size contracting stems with a small basal width to maximum width ratio of less than or equal to 0.35 were previously classified as Elko series (Elston et al. 1977; Leventhal 1977). Recently, Elston revised his regional point type classification scheme to subsume the narrow Elko Contracting Stem form into the Martis Contracting Stem type (Elston et al. 1994:15-16). Elston reclassified the narrow contracting stem forms following Thomas's lead (1981), where Thomas changed the Elko Contracting Stem point form to Gatecliff Contracting Stem because contracting stem points were stratigraphically associated with Gatecliff Split Stem points instead of the later Elko Corner-notched points.

The elimination of Elko Contracting Stem forms bolsters Elston's contention that contracting stem point forms are older than the Elko series notched and eared forms (Elston et al. 1994). In fact, other ongoing research suggests that contracting stem forms were used from Early Archaic times (Milliken and Hildebrandt 1997), probably with antecedents in the Pre-Archaic Great Basin Stemmed series.

Gunther and Rose Spring Series Projectile Points

At the other end of the temporal spectrum, it is unfortunate that Gunther series point types have slipped into use in the eastern Sierra chronology. Most morphological attributes of the Tahoe Sierran arrow size shouldered contracting stem forms are more like Rose Spring contracting stem forms than the Gunther series. In fact, what has passed for Gunther on the eastern Sierran front (Zeier and Elston 1986) is now classified as Rose Spring series, and as small stemmed points, all along the eastern Sierran Nevada/Cascade front (Delacorte 1997). Hence, the Rose Spring series is used here to classify arrow size corner-notched and contracting stem point forms that lack the typical barbed shoulders and other distinctive attributes of the western Sierran Gunther series. Projectile point types used in the Tahoe Sierra as temporal indicators of Eastern Sierra Front Chronology are listed in Table 1.

LAND USE

Basic issues of site structure and assemblage diversity are interpretable within the contexts of subsistence activities and site function, as a reflection of larger land-use settlement patterns (e.g., seasonal mobility). Questions about site activities, resource availability, foods, food processing and seasonality are key issues, designed to provide the archaeological foundation for addressing temporal and spatial associations of the local land-use patterns as well as for addressing the connections between Donner Lake land use and the larger Tahoe Sierra. In this way, land-use issues addressed by inquiry at the Donner Lake site plugs into the bigger picture of region-wide settlement and subsistence (Lindström et al. 2002). Attention is also given to subsistence and demographic shifts, and their correlation with environment and other archaeological patterns.

The Donner Lake/Truckee River vicinity is archaeologically rich, with a high density and diversity of site types (Elston et al. 1977). Site types include residential complexes, probable fishing camps, milling stations, lithic reduction workshops and quarries. Together these sites suggest a diversity of settlement and subsistence activities occurred across the landscape.

The current investigations at CA-NEV-13/H, Locus F and Locus G, comprise a small part of a large complex site. Nevertheless, this area sits in spatial and temporal association with other CA-NEV-13/H loci, as well as with other similar age occupation and task sites located throughout the Donner Lake vicinity and along the Truckee River. Hence, the prehistoric settlement at Donner Lake probably held a central place in the larger picture of Donner Lake and Truckee River land use.

LITHIC TECHNOLOGY

Lithic technology research at Donner Lake is primarily concerned with flaked stone. Flaked stone technology is studied to interpret the use of flaked stone within multiple and interconnected systems of toolstone procurement, tool manufacture, tool use, maintenance, reuse, discard and scavenging reuse. Technological systems reflect adaptations to subsistence needs, as well as toolstone availability. Therefore, flaked stone technology evident at a place crosscuts multiple research domains by reflecting adaptation in settlement, subsistence, toolstone procurement and general land-use patterns.

Biface technology was generally predominant throughout the Tahoe Sierra, with an intensification of large biface production during the Middle Archaic. The large percussion bifaces were used as reliable multipurpose tools, as well as serving as flake cores. Core reduction technology was primarily used to produce large flakes, which in turn were used to manufacture bifacial tools and flake tools. The emphasis on percussion bifacing persisted until the end of the Middle/Late Archaic transition, when the production of large bifaces was partially replaced by greater emphasis on a small core/flake technology and the use of small bifaces. Percussion reduction decreased in favor of using primarily pressure reduction.

To a certain extent, the technological shift from biface technology to core/flake technology coincides with the advent of the bow and arrow at the Middle/Late Archaic transition. At that time, atlatl long darts tipped with large projectile points were replaced by arrows tipped with small projectile points. Projectile point manufacture gradually shifted from using percussion and pressure reduced biface preforms to using primarily pressure reduced flake blank preforms (Ataman and Drews 1992:206; Ataman et al. 1999:7–11; Moore 1992:B31–B36). This technological shift in point manufacture reflects the change from a biface based technology to a flake/core technology.

The distinction between Middle Archaic and Late Archaic flaked stone toolkits is a shift from using larger dart size atlatl projectile points, large bifaces and large retouched flake tools, to using small arrow points, smaller bifaces, and probably flake tools with little or no retouch. Toolstone use also changed during the Middle/Late Archaic transition. Basalt was the primary toolstone used during the Middle Archaic, with a moderate use of obsidian and little use of chert and the other cryptocrystalline silicates. Chert was often used only to manufacture large retouched flake tools. In Late Archaic assemblages, chert usually predominates and obsidian is secondary.

Tool manufacture is the most basic issue addressed by technological analyses of flaked stone assemblages. The goal is to interpret flaked stone tool use within the systems of tool manufacture, known as reduction trajectories. Biface, core and flake blank reduction trajectories for basalt, obsidian and cryptocrystalline silicates have recently been outlined for Tahoe Sierra assemblages (Ataman et al. 1999; Bloomer et al. 1997). These trajectories are applicable to comparative studies throughout the Tahoe Sierra, but were likely varied across the region and through time. Describing the technological character of the local assemblages places them within the regional systems of toolstone use to provide a foundation for modeling procurement, manufacture and transport.

Technological data sets and interpretive discussions serve as a basis for assemblage comparisons across the Tahoe Sierra to facilitate future discussions about the role of local tool manufacture and subsistence activities within regional land-use and settlement patterns. Fundamental questions address the kinds of toolstone used, the forms of imported toolstone, the kinds of tools made and their manufacture trajectories. Broader analyses look at intrasite temporal and spatial variability, correlations with environmental and cultural changes, and the patterns of toolstone procurement and tool manufacture across the region. To fully realize the research potential of lithic studies, it is necessary to combine technological analyses with geochemical basalt and obsidian source analyses, thereby providing distribution data for procurement patterns, reduction strategies, tool use and tool use-life.

TOOLSTONE PROCUREMENT

The study of the patterns of local and regional toolstone acquisition is an important aspect of flaked stone technology and Tahoe Sierra prehistory. These patterns are revealed by the ability to detect a distinctive geochemical signature and thereby determine the original geological source of basalt and obsidian using XRF analysis. An analysis of lithic raw material distribution and use provides clues as to how toolstone was moved over the landscape and addresses larger issues concerning settlement dynamics, population movement and/or resource movement via prehistoric travel and trade. Toolstone selection has varied through time and is considered to have been affected by technological requirements and restricted access to previously available materials, with an increased reliance on local materials and scavenging as the availability of exotic materials decreased.

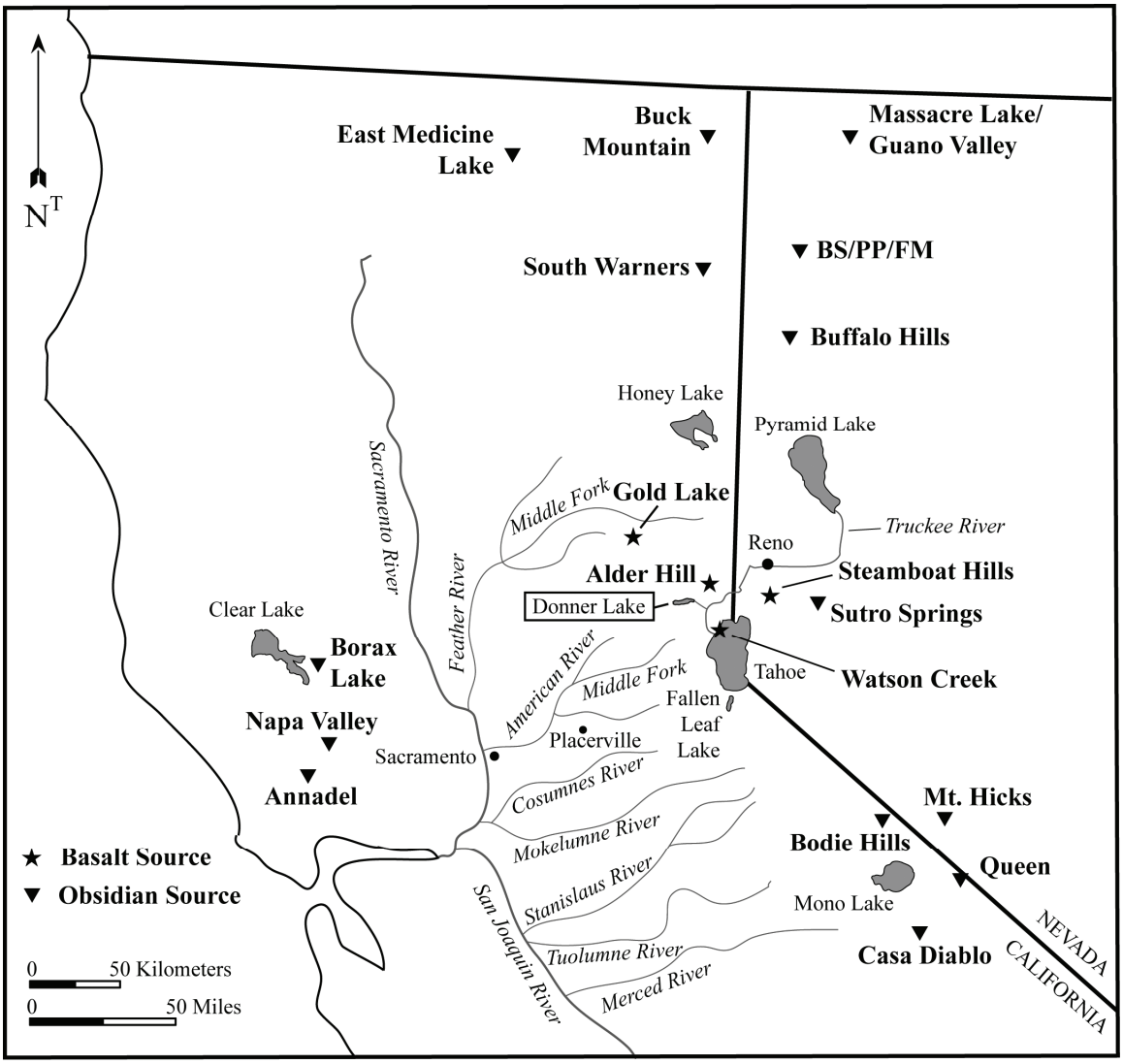

Figure 7. Basalt and Obsidian Source Locations.

Sourcing studies identify the kinds of basalt and obsidian being transported to Donner Lake and, therefore, the directionality of transport. This data leads to interpretations of land-use patterns and the spatial interaction sphere for Donner Lake inhabitants. The form of the transported basalt and obsidian is important in assessing how procurement was organized as part of the land-use strategy. The presence of only projectile points from a specific distant source might suggest exchange, while cores, early stage bifaces and manufacture debitage indicate procurement and processing were conducted as part of regularized land use.

A comprehensive overview of north Sierran basalt quarry and source studies is presented in a report of investigations at the Watson Creek basalt quarry (Bloomer et al. 1997), located approximately ten miles southeast of Donner Lake. Seventeen quarries and five geologic sources have been recorded in the northern Sierra (Bloomer et al. 1997:Map I-3). Those 17 quarries represent 14 distinct chemical groups. Five primary basalt sources occur at varying distances from Donner Lake, including Alder Hill, Sawtooth Ridge, Watson Creek, Steamboat Hills and Gold Lake (see Figure 7).

Obsidian across the Tahoe Sierra came primarily from Bodie Hills, approximately 100 miles southeast of Donner Lake. Numerous other sources occur at equally distant locations around the Bodie Hills vicinity, in northwestern Nevada and northeastern California, and west to the Napa/Clear Lake region (see Figure 7). Obsidian frequencies of the lesser sources vary across the Tahoe Sierra, relative to the varying distances from those sources (Markley and Day 1992).

Chapter 5: Methods

Methods used to effectively and efficiently assess the research potential and eligibility of resources within Locus F and Locus G included a combination of professional field personnel, archaeological fieldwork, geomorphology and artifact analyses. Laboratory artifact processing and obsidian and basalt studies are also discussed.

FIELD PERSONNEL

The foundation of the field crew was provided by Furlong Archaeological Consulting and consisted of co-principle investigator/field directors William Bloomer (Lithic Arts) and Jim Nelson (Furlong Archaeological Consulting). Furlong also contracted with Jerry Doty and Oliver Patsch to provide technical expertise in excavation and feature recordation. In addition, State Parks cultural resources staff, working part time, included Denise Jaffke, Scott Green, Kathie Lindahl and Kelly Long. Todd Jaffke volunteered a full day of excavation talent.

Lynda Shoshone served as the Native American consultant to provide coordination with the Washoe Tribe.

Visitors included John Foster (Parks), Jeff Rosenthal (Far Western Anthropological Research, Inc.) and Henry Davis.

ARCHAEOLOGICAL FIELDWORK

Archaeological test investigations at CA-NEV-13/H, Locus F and Locus G, were completed in 11 days, from September 18 to September 28, 2005. Field methods were based in part on the results of previous CA-NEV-13/H investigations conducted at Locus F/G (Bloomer and Lindström 2006a; Jaffke 2005), as well as in the vicinity of Locus E (Riddell 1980) and on the edge of Locus B (Green and Solis 2005). The number and sizes of surface and subsurface units excavated during fieldwork were tailored to most efficiently and effectively investigate archaeological deposits. In total, 46 sample units were excavated to varying depths for an excavated volume totaling 13.85 cubic meters (Table 3; Figure 8 and Figure 9).

Surface Investigations

Surface investigations within Locus F and Locus G began with a pedestrian surface survey, walking within two-to-five-meter-wide transects back and forth across the loci. All surface artifacts were pin-flagged. Surface

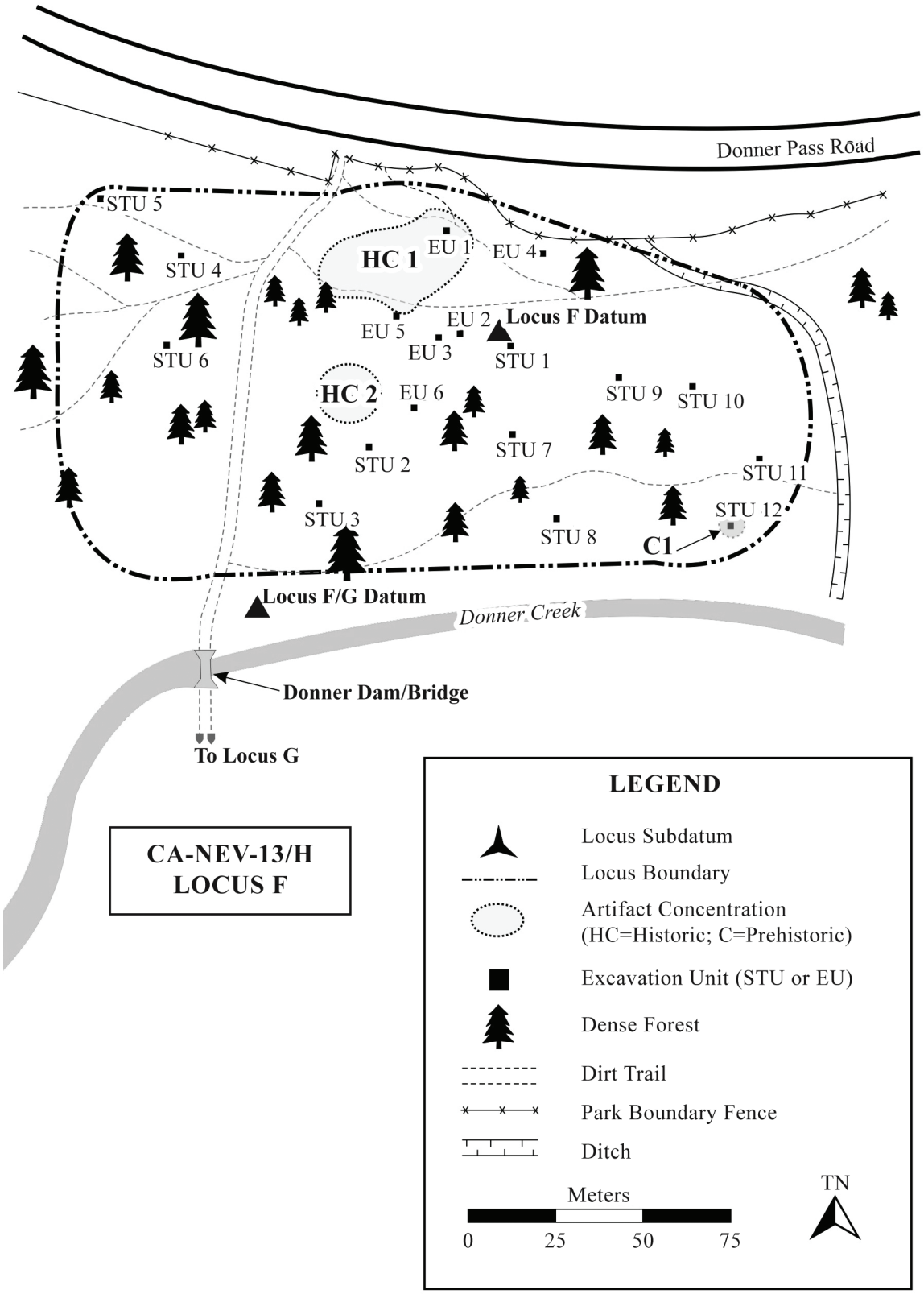

Figure 8. Locus F Map Depicting Excavation Units.

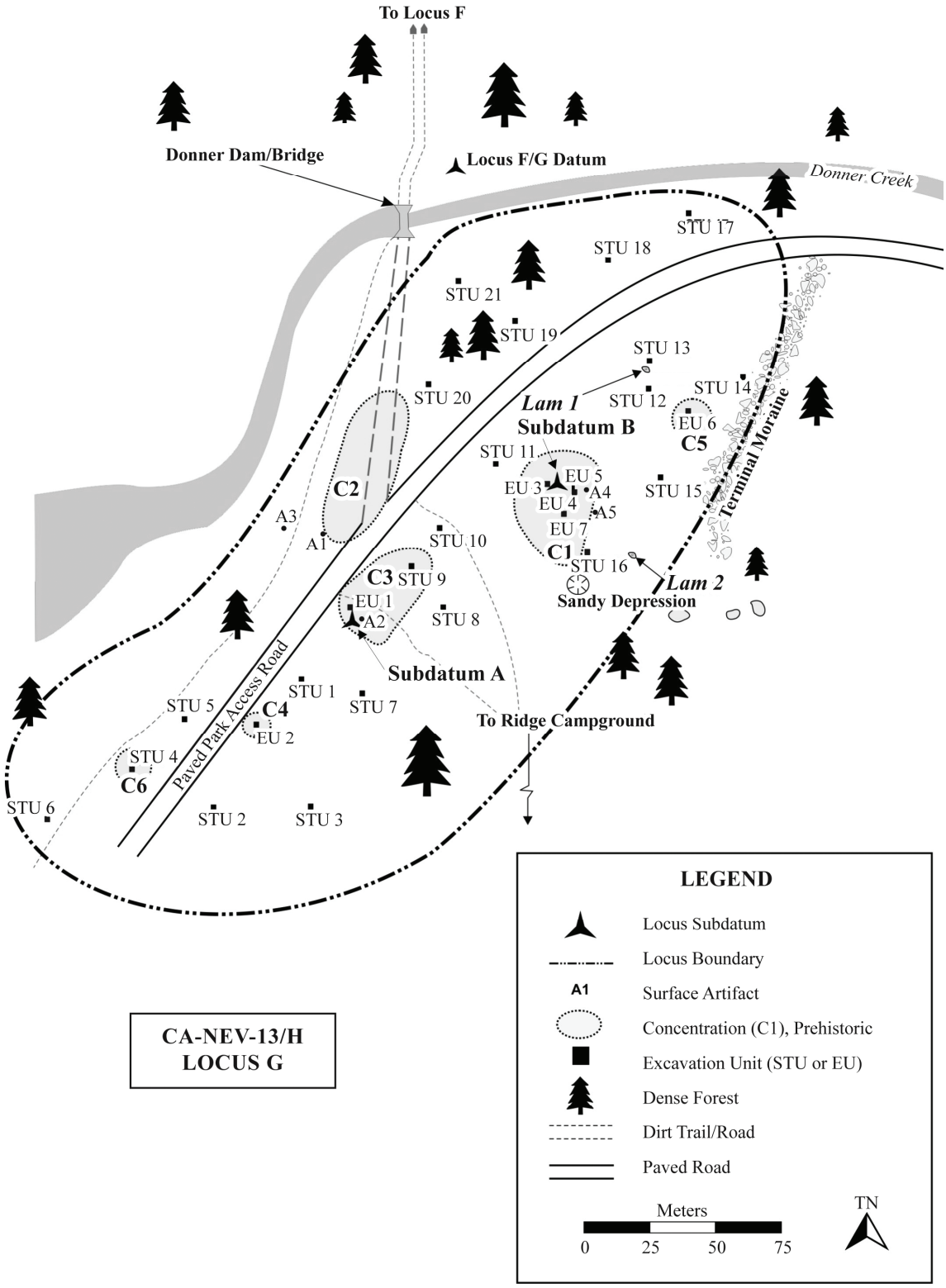

Figure 9. Locus G Map Depicting Excavation Units.

artifact distributions were mapped and tools were collected. Two surface concentrations of historic artifacts (Historic Concentration [HC] 1 and HC2) were defined in Locus F. Five surface concentrations of prehistoric artifacts (C1–C5) were defined within Locus G.

Surface investigations continued with the excavation of 33 1-x-1-meter, 10-centimeter-deep surface test units (STU; Table 3), placed in areas of high and low artifact density (see Figure 8 and Figure 9) to investigate and document surface artifact densities and diversity. Surface artifact distributions represent site structure and typically reflect subsurface artifact distributions in granitic sandy silt forest sediments. Prehistoric artifact concentrations C1 in Locus F and C6 in Locus G were defined based on the high number of artifacts discovered during STU excavations, below thick duff. STU 2 in Locus G was excavated to 20 centimeters deep because of thick decomposed organics above mineral soil in the 0–10-centimeter excavation level.

Table 3. Surface and Subsurface Excavation Unit Types, Sizes and Volumes.

UNIT TYPE	UNIT SIZE (M)	NUMBER	SCREEN MESH (-INCH)	VOLUME (M^3)
LOCUS F				
STU	1x1	12	¼	1.2
EU	1x1	6	¼	5.4
Subtotal	-	18	-	6.6
LOCUS G				
STU	1x1	21	¼	2.2
EU	0.5x1	1		0.55
EU	1x1	6	¼	4.5
Subtotal	-	28	-	7.25
Total	**-**	**46**	**-**	**13.85**

Subsurface Investigations

Subsurface investigations within Locus F and Locus G targeted high artifact densities. All excavation units (except for Locus G, Excavation Unit 5) were 1 x 1 meters square with excavated sediments sifted through ¼-inch mesh screen.

Locus F

Excavation Unit 1 (EU1) was placed over a high density of historic artifacts (Feature 1) at the northeast end of concentration HC1. This unit was dug to 50 centimeters below surface, exposing a pit feature filled with historic artifacts. EU 5 was placed to sample the south edge of the HC1 concentration. It was excavated to a depth of 100 centimeters, recovering both historic and prehistoric artifacts. EU 2–4 were placed to sample the prehistoric deposit in areas of good surface visibility. Depths ranged from 80 to 110 centimeters. EU 6 was placed to sample between high density areas, below thick forest duff. This unit was excavated to 100 centimeters deep, recovering the highest number of artifacts in Locus F.

Locus G

Excavation units EU1, EU2 and EU 6 were placed to sample small prehistoric artifact concentrations. EU 3, EU4 and EU7 were excavated to maximize the investigation of concentration C1, which appeared to have been a primary activity area with a high potential for important subsurface deposits and features. EU5 was an 0.5-x-1.0-meter unit, excavated as a northern extension of EU4. EU5 sediments were sifted through ⅛-inch screen mesh to maximize the recovery of small size artifacts.

LAM RECORDATION

Lam 1 and *Lam* 2 were recorded in the field by Jerry Doty. Denise Jaffke artistically rendered Jerry's technical field illustrations.

GENERAL FIELD METHODS

All excavation units and surface test units were provenienced at their southwest corners from the Locus sub-datums.

Unit/level records were completed by unit excavators. All prehistoric and historic artifacts recovered in ¼- and ⅛-inch size screen were collected, sorted by artifact type, placed in plastic bags and tagged with the appropriate provenience. All artifacts from a specific unit/level were stored in provenienced paper bags, which were put in archive boxes for transport to the Furlong laboratory in Yankee Hill, California, for processing and cataloging in preparation for analyses.

STUs were backfilled immediately after excavation. All open EUs were covered with plywood when not being excavated. EUs were backfilled at the end of excavation and stratigraphic analysis.

Digital photographs documented excavation unit stratigraphy, cultural strata, features and the general day to day progress of the investigation.

Geomorphology and stratigraphic analysis were conducted in-field in conjunction with subsurface excavations.

LABORATORY COLLECTIONS PROCESSING AND CURATION

All prehistoric and historic artifacts collected were prepared for curation and cataloged according to standards specified by State Parks' Archaeological Collections Research Facility in West Sacramento and in accordance with 36 CFR § 79. The collections are stored under accession number P1443. A comprehensive artifact catalog is presented in Appendix B.

All artifacts were washed with tap water and bagged in 4.0-millimeter sealable plastic bags. With the exception of debitage and bone fragments, each artifact was given a unique catalog number. A label, printed on acid-free paper, was inserted in each bag, indicating the site, accession and catalog numbers, as well as provenience, artifact type, descriptive characteristics, count and weight. The catalog number was written in ink on each diagnostic or formed tool in a discrete location. Artifacts were organized by STU/EU and category (e.g., projectile point, debitage), arranged by accession and catalog numbers and placed in bin boxes. A master catalog with basic fields for each entry, in digital and printed formats, accompanies the collection along with a digital copy of this report. Basic fields for

each entry include the accession number, catalog number, locus, unit type and number, provenience (as appropriate), unit size, mesh size, depth, artifact class, artifact type, material, count, weight and comments.

FLAKED STONE ANALYSIS

Technological analyses were conducted for the flaked stone tools and debitage, incorporating a suite of morphological characteristics and technological attributes to study assemblage composition and tool manufacture and maintenance patterns. Results of the flaked stone tool analysis describe the typologically time diagnostic projectile points that serve to support chronological interpretations and a tool assemblage that is a representative expression of site activities. Technological debitage analysis details the kinds of flaked stone tool making and maintenance activities conducted across the site. General methods of flaked stone analysis applied to all tools are described first. Tool type definitions follow, with specific analytical methods for each tool type. Debitage is also defined with a discussion of technological debitage analysis.

General Methods

Analytical data includes *toolstone type*, *condition*, *metric dimensions*, *blank type*, *breakage type*, *extant flaking technique*, and *use wear* with specific comments for each artifact. Additional recorded typological descriptions and morphological attributes are discussed below for each tool type. The analytical data are tabulated for each tool type in Appendix C.

Toolstone type is recorded as basalt (BAS), cryptocrystalline silicate (CCS—including chert, sinter and opalitic wood) and obsidian (OBS). Condition classifies the artifact as a whole specimen, or as one of several fragment types. Condition was recorded as whole (WHL), nearly complete (NCO), proximal (PRX), medial (MED), distal (DST), undifferentiated end (END), lateral margin (LAT), undifferentiated margin (MRG), or undifferentiated fragment (FRG). The recorded metric dimensions include length, width, thickness, and weight.

Blank type describes the form of the unworked piece of toolstone at the beginning of artifact manufacture, and so, is important for understanding toolstone procurement and the initial steps in tool manufacture. Blank types might include cobble, pebble, block, flake, or any of the technologically diagnostic flake types defined below in the discussion of debitage analysis. Indeterminate blanks are worked beyond the point where original blank morphology is visible.

Breakage types often indicate whether an artifact was broken during manufacture or maintenance reduction, use, or as a result of post depositional processes. Unfortunately, general bending fractures are the most common break type. They can result from reduction, use, or post depositional trampling, and so are not diagnostic. Transverse bending fractures, perverse fractures, outrepassé removals, material flaws, and some thermal breaks indicate manufacture failure. Bending fractures are typically flat and perpendicular, caused by tension or compression from impact shock or trampling that bends the artifact beyond its limits. If concentric rings are visible on the break, they emanate from the center of one face. Transverse bending fractures are the same as general bending fractures, except that the concentric rings emanate from one lateral edge indicating that intentional percussion

initiated bending. Perverse fractures are spiral or twisting breaks, initiated as a flake removal at the artifact's edge. An outrepassé is an "overshot" flake removal that went too far across the artifact's face, removing the opposite margin. Material flaws are vugs, irregularities or natural fracture planes within the unworked toolstone, which become apparent during reduction. Thermal breaks, such as internal crenulations and curvilinear fractures, result from failed heat treatment during the manufacture process. Thermal breaks, such as pot lids and surface crazing, result from post depositional exposure to direct flame.

Use is sometimes indicated by bending fractures with finial terminations, which extend the fracture scar beyond the bending plane, lipped onto one face of the artifact. This lipped extension is often caused by a forceful impact at the tip of an artifact such as when a projectile point hits a hard object. Burination scars along a lateral edge, or facial, also reflect use impact. General percussion fractures might also reflect use, or failed reduction.

Extant flaking technique concerns the method of flake removal, indicated by the types of negative flake scars apparent on the discarded artifact. Flaking techniques, including percussion, pressure, a combination of percussion and pressure, and bipolar, are recorded to identify reduction patterns that might vary by site area and through time. Sometimes, especially during the finishing stage of biface reduction, pressure flaking can obliterate the evidence of previous percussion reduction. Microflaking typically results from use of an artifact's edge for scraping or cutting. Other use wear along a tool edge is macroscopically evident as micro-step fractures, crushing, rounding, and polish.

Projectile Points

Projectile points are typically bifacial tools with a pointed tip and basal hafting elements, such as notches or a stem, used to attach the point to an arrow or dart shaft. Most points are extensively shaped and well formed, using pressure reduction techniques during final shaping. Point type classifications and chronological interpretations are based on the foundation laid by Elston et al. (1994, 1995a). Metric attributes were recorded as defined by Thomas (1970, 1981). Bifacial tool fragments that might be projectile point parts, such as distal tips and medial sections, were classified as biface fragments.

Bifaces

Bifaces are flaked stone tools that are relatively ovate in shape, but pointed at one or both ends, with lenticular cross-sections at their greatest width. Bifaces differ from projectile points in that they have no distinct hafting elements, such as notches or a stem, for attachment to arrow or dart shafts. Finished bifacial tools are typically well shaped using percussion and/or pressure reduction techniques, which leave flake scars across both faces of the biface.

During manufacture, bifaces go through several technological stages of reduction from initial shaping to the final form. Therefore, bifaces in this collection have been classified by manufacture stage to study tool production. In addition, each biface is recorded as to whether or not it was discarded as a manufacture failure.

Biface stage classifications follow a five stage adaptation (Bloomer et al. 1997:Appendix H) of Callahan's (1979) more comprehensive stage classification system. In brief, stage categories are based on percussion and pressure flake scar patterning, which reflects the extent of reduction through the continuum of biface manufacture. Completeness of shape is also a variable, in that the shape becomes refined through manufacture from an

irregular flake blank to a symmetrical and straight edged final form. At any point along the reduction continuum, a biface might have been used as a tool, with subsequent reduction directed towards continued manufacture or maintenance.

Stage 1 bifaces are essentially flake blanks showing only minimal reduction, which served to remove large irregularities. Stage 2 bifaces have undergone initial shaping and edge preparation to make a bifacial edge for further reduction and thinning. Initial biface thinning and shape regularization occurs during stage 3. Stage 4 bifaces show secondary thinning and are typically well shaped. Final shaping occurs during stage 5, usually with pressure reduction. Small fragments of extensively well shaped bifacial tools are often classified as stage 5. Small fragments with less distinct reduction attributes are classified as general early stage (stages 1–3) or general late stage (stages 3–5).

Drills

Drills have a unique morphology, consisting of a long or short and narrowly constricted well shaped bit, used to bore a hole or perforate. The bit cross-section is typically thick. Although, in this collection the drills are flakes with small, wide and flat projections. The drill base is typically broader, shaped or unshaped, for holding or hafting. Morphological attributes specifically recorded for the drills include bit modification, bit cross-section shape and base modification.

Unifaces

Unifaces are intentionally flaked and sometimes extensively shaped so that original flake blank morphology is obscured. Unifaces typically have well shaped steeply angled unifacial use edges. Attributes recorded for unifaces include number of modified edges and primary edge shape.

Flake Tools

Flake tools are reduction flakes, which have been intentionally modified by percussion or pressure to manufacture a use edge, as well as flakes with less invasive edge modifications that could have been produced directly by use. Attributes recorded specifically for flake tools include number of modified edges, primary modification and primary edge shape.

Edge Modified Flakes

Edge modified flakes (EMF) are reduction flakes, which have been intentionally modified by percussion or pressure, but show no apparent use wear. Therefore, EMFs might be flake tools, but are more often tool manufacture failures. Attributes recorded specifically for EMFs include number of modified edges, primary modification and primary edge shape.

Cores

Cores are masses of toolstone from which usable flakes were removed by percussion. Core type was recorded as multi-directional, bifacial, unidirectional or bipolar. Each type describes the flake scar patterning that reflects the technique used for producing flakes. Bipolar cores were struck while resting on an anvil, removing thin straight flakes from opposite directions at the same time.

Debitage

Debitage is the waste flakes produced by percussion and pressure reduction techniques during flaked stone tool manufacture. A technological analysis of the debitage was conducted to characterize the predominant flaked stone reduction patterns. The assumption behind technological analysis is that distinct reduction activities produce distinct debitage assemblages. The reduction technology evident for any given debitage assemblage is characterized by the variable proportions of the diagnostic flake types. Core reduction and the initial reduction of flake blanks produce high percentages of cortical flakes and interior flakes, with only a low frequency of edge preparation flakes and no biface thinning flakes or pressure flakes. Biface reduction, through the entire continuum of early (stage 2 and 3) to late stages (3 and 4) and pressure flaking (stage 5), results in a relatively even representation of each flake type. An assemblage primarily composed of late stage biface reduction debris will be dominated by late stage biface thinning flakes and pressure flakes, evincing only small frequencies of cortical flakes, interior flakes, edge preparation flakes and early biface thinning flakes. When thin flake blanks are pressure flaked, with little or no initial percussion thinning, early pressure flakes are conspicuous in the assemblage. In this case, pressure flakes, including early and late pressure flakes, will comprise a large part of the debitage assemblage.

In addition, the extent of reduction through the core and biface reduction continuums indicates the kinds of tools that were made. Core reduction generally produced flakes for flake tools. Core reduction flakes also became flake blanks for bifacial tool manufacture. Biface reduction of a flake blank is the process of making bifacial edges and shaping bifacial forms. The biface goes through successive stages of reduction to produce a well shaped relatively symmetrical and lenticular finished form. The further along the biface reduction continuum, the better shaped is the bifacial tool.

Twelve flake type categories are considered technologically diagnostic in this analysis. That is, the relative proportions of these flake types provide clues to the techniques and stages of tool manufacture, and to the kinds of tools being made. The diagnostic flake types include: cortical, simple interior, simple interior/complex platform, complex interior, complex interior/simple platform, edge preparation, early biface thinning, late biface thinning, early pressure, late pressure, notching pressure and bipolar. Five other flake type categories are considered non-diagnostic. The non-diagnostic flake types include platform preparation/pressure, simple fragment, complex fragment, cortical fragment and shatter.

Flake Types

Cortical – a flake with cortex, generally covering over 25% of its dorsal surface. Other flake types with small amounts of cortex, such as biface thinning flakes, are not classified as cortical flakes.

Simple Interior – a non-cortical flake with three or fewer negative flake scars on its dorsal surface, not counting platform preparation scars. Negative flake scar patterning on the dorsal surface is typically linear along the axis of the flake. Simple, single-facet platforms are typical.

Simple Interior/Complex Platform – same as for a simple interior flake, but the platform is complex with multiple facets.

Complex Interior – a non-cortical flake with three or more negative flake scars on its dorsal surface, not counting platform preparation scars. Negative flake scar patterning on the dorsal surface is not typically linear along the axis of the flake, but shows a complexity of scars emanating from various and opposing directions. Platforms are usually complex with multiple facets.

Complex Interior/Simple Platform – same as for a complex interior flake, but the platform is simple, usually with a single facet.

Edge Preparation – a group of several distinct flake types, which result from shaping an unworked edge of a flake blank. These flakes include *edge preparation flakes*, which are wider than they are long, with pronounced bulbs of percussion and large dorsal areas with few or no negative flake scars; *bulb removal flakes*, which retain a remnant of the flake blank's ventral bulb of percussion; and *alternate flakes*, which are wider than long, and wedge shaped, resulting from the reduction of a thick square edge.

Early Biface Thinning – an often slightly curved flake with a simple or complex bifacial platform and a few dorsal flake scars which emanate generally from the flake's platform.

Late Biface Thinning – a curved or flat flake with a bifacial platform and multiple dorsal flake scars, which may reveal a complex pattern of previous flake removals. Typical late stage thinning flakes retain partial dorsal scars showing previous flake removals from the opposite edge of the biface.

Early Pressure – the first pressure flakes removed from a flake blank or early stage biface show few to no dorsal flake scars, depending on the morphology of the worked surface. Platforms may be perpendicular or oblique to the longitudinal axis of the flake. Shapes vary from wide and short to long and narrow.

Late Pressure – late pressure flakes have a complex dorsal surface, and platforms are typically oblique to the longitudinal axis of the flake. Shapes are most often long and narrow, and either straight or doglegged.

Notching Pressure – notching flakes result from notching a projectile point. Notching flakes are fan shaped, short and round, with the platform set into a depression.

Bipolar – bipolar flakes are a result of percussion from opposite directions at the same time, typically from placing the toolstone mass on an anvil and then down striking with a hard hammerstone from above. Flake attributes include crushing at opposite ends, with distinct cones of percussion and straight ventral and dorsal surfaces.

Platform Preparation/Pressure – platform preparation flakes typically result from the light percussion of a bifacial edge to prepare a flake detachment platform. Pressure flakes are often indistinguishable from light percussion platform preparation flakes, and so this category subsumes less distinctive flakes, which may have resulted from pressure reduction.

Simple Fragments–typically fragments of simple interior flakes.

Complex Fragments–typically fragments of complex interior flakes, biface thinning flakes, pressure flakes and platform preparation/pressure flakes.

Cortical Fragments – fragments of cortical flakes.

Shatter – angular fragments of toolstone without typical flake attributes. Shatter includes fragments and potlids from unintentional thermal alteration.

Flake Size

All debitage was size sorted for technological analysis. Size grades include 1, ½, ¼, and ⅛ inch. These size grades represent the screen mesh size that will hold the debitage.

GROUNDSTONE

Descriptive analyses were conducted for the groundstone artifacts and features, i.e., *itdemge* (portable millingslabs) and *lam* (bedrock milling features). Analytical data includes toolstone type, condition and metric dimensions with specific comments for each artifact and feature. Recorded morphological and use attributes are discussed below for each tool type. The analytical data are tabulated for each tool type in Appendix C.

Toolstone type is recorded as granite (GRN). Condition classifies the artifact as a whole specimen, or as one of several fragment types. Condition was recorded as whole (WHL), nearly complete (NCO), proximal (PRX), medial (MED), distal (DST), undifferentiated end (END), lateral margin (LAT), undifferentiated margin (MRG) or undifferentiated fragment (FRG). The recorded metric dimensions include length, width, thickness and weight.

Lam (Bedrock Milling Stations)

Lam are permanent bedrock milling stations. Recorded morphological and use attributes include boulder dimensions, use surface dimensions, use surface shape and wear texture, and whether or not pecking and striations are present.

Itdemge (Portable Millingstone)

Itdemge are typically movable boulders or tabular slabs used as a grinding surface with *gamum* (handstone) to grind seeds to flour. *Itdemge* (milling slabs) are characterized by smooth polished grinding surfaces. Recorded attributes include type, presence of shaping, wear texture, use area shape, use area depth and whether or not pecking, striations and pigment are present.

FAUNAL ANALYSIS

The faunal bone collection was analyzed and reported by Denise Furlong of Furlong Archaeological Consulting. Analytical data (Appendix C) includes taxonomic names (scientific and common), anatomical part, portion and side, age/fusion, natural modifications, cultural modifications, other modifications, evidence of burning, count and comments.

All of the faunal material was first sorted into identifiable bone elements and fragmentary bone categories. Following the initial sorting, each specimen was classified to element, portion of element, side and taxon. In addition, cultural modifications (e.g., degree of burning, cut marks, polishing) and natural modifications (e.g., rodent and carnivore gnawing, root etching, weathering) were recorded when observed. A faunal specimen was considered unidentifiable if it could not be identified to the ordinal level. The faunal assemblage was quantified using numbers of identified specimens (NISP). Attempts were made to identify specimens to the most specific taxonomic level possible. Those specimens assigned to the class level were further divided into size categories (e.g., large mammal).

HISTORIC ARTIFACTS

Historic artifact analysis was conducted by Denise Jaffke, Parks Sierra District Associate State Archaeologist. Denise looked at all the historic artifacts, adding descriptive notes to the catalog comments column. In addition, manufacturer, date range and reference information was added to catalog data columns for diagnostic artifacts. Denise's descriptions are the foundation for the descriptive text and tables in the Historic Artifact section of this report.

OBSIDIAN AND BASALT STUDIES

Forty-three obsidian tools and debitage were submitted to Northwest Research Obsidian Studies Laboratory for hydration analysis, with 28 subjected to geochemical source analysis using XRF analysis. Twenty-seven basalt artifacts were also submitted to Northwest Research for geochemical analysis. Northwest Research Obsidian Studies Laboratory Report 2006-99, including analytical tables, is presented in Appendix D.

RADIOCARBON ANALYSIS

One charcoal sample from Locus G was submitted to Beta Analytic, Inc. for standard radiocarbon (14C) analysis. The Beta Analytic report, including analytical tables, is presented in Appendix F.

Chapter 6: Excavation Results

Results of the test investigation present a comprehensive archaeological study of the Locus F and Locus G deposits. Donner Lake outlet geomorphology and stratigraphy are discussed up front to set the landscape for discussions of site structure and assemblage diversity. The artifacts are then described in detail to highlight the data sets that are the foundation for research discussions and interpretive conclusions.

DONNER LAKE OUTLET GEOMORPHOLOGY AND STRATIGRAPHY

(Adapted from D. Craig Young's contribution to Archaeological Data Recovery Investigations at Donner Dam, Bloomer and Lindström 2006a.)

Donner Lake occupies a glacial trough formed through a series of Plio-Pleistocene glacial advances and retreats. Landforms of the latest glacial cycle, the Tioga glaciation (Birkeland 1964) of the late Pleistocene, are preserved in the valley bottom and impound surface waters of the lake. In addition to ground and marginal moraines preserved near the valley's terminus at Highway 89 and the Truckee River, there are five distinct recessional moraines that influence drainage of surface water from the lake (Figure 10). The moraines mark pauses during general glacial retreat (Tioga-phase recession) between about 18,000 and 12,000 years ago; the moraines are younger from east to west. As moraines form during retreat, outwash channels maintain drainage through the moraines so that moraines rarely produce complete natural dams. Eventually outwash cannot remove glacial debris and a lake fills the void left by the retreating ice. Outwash channels of the Donner glacier extended along the north side of the glacial trough, the outwash path is marked by the north-side truncation of each moraine. Post-glacial drainage from Donner Lake (i.e., Donner Creek) followed a similar course along the northern margin of the valley.

Donner Creek, in its modern configuration, cuts through four moraines on its short reach before joining the Truckee River. Sites are often preserved and have surface exposure along moraine ridges, but they may also be buried in the swales that separate individual moraines. Locus F and Locus G occupy outwash landforms and the north end of a low north-south oriented recessional moraine (moraine 3a, Figure 10) at the east end of Donner Lake. The artifact concentrations at Locus F and Locus G indicate that the portions of the outwash landform adjacent to the modern channel of Donner Creek

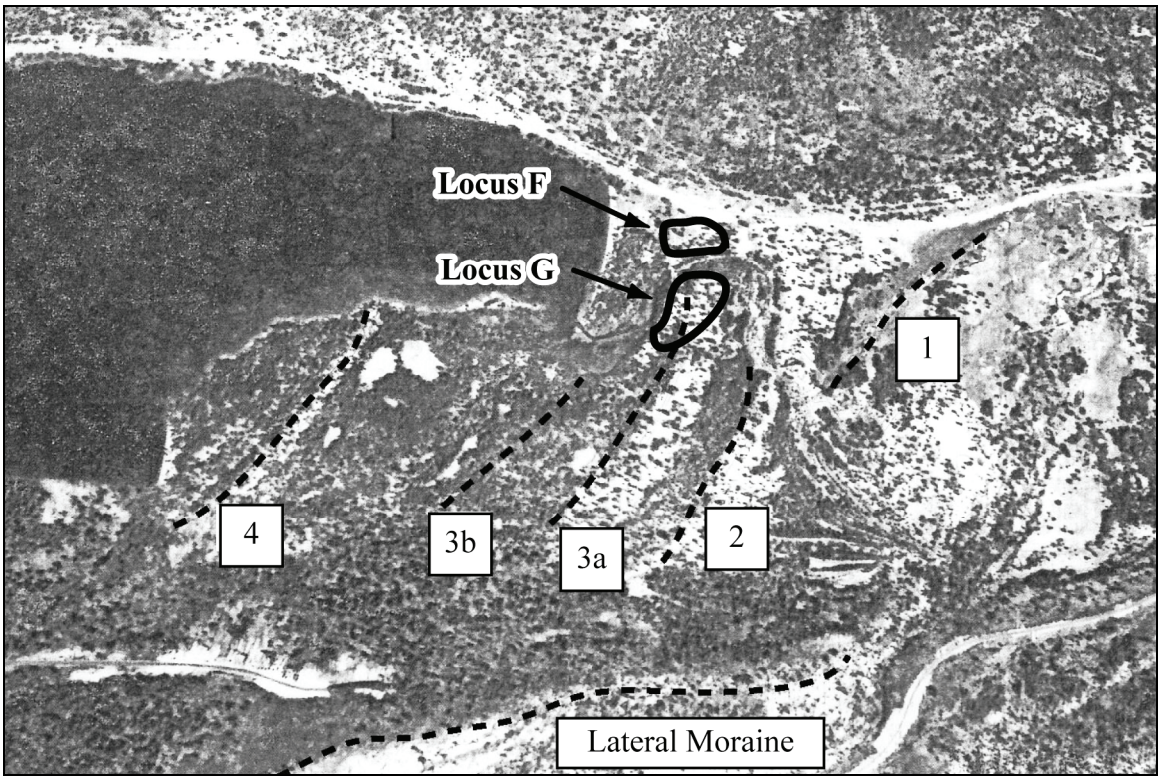

Figure 10. Donner Lake Recessional Moraines (1, 2, 3a, 3b and 4) and a Lateral Moraine (1939 aerial photo).

retain good archaeological integrity, even though prehistoric and historic-era lake highstands and subsequent floods have inundated the area.

Stream flow in Donner Creek is controlled by outflow from the lake basin. During the Holocene, the elevation of Donner Lake has fluctuated dramatically. Lindström (1997:266) reports submerged trees on the northern margin of the lake at approximately 10 meters below the lake's modern spill elevation. The now-submerged stumps have been radiocarbon dated to approximately 500 years ago. These dates, along with dated, submerged stumps in Independence Lake from 670 years ago, provide evidence for relatively prolonged drought beginning sometime prior to 700 years ago (Lindström 1997).

Corresponding to the late drought of the Medieval Climatic Anomaly (Stine 1990), this regional drought would have shifted the local mosaic of lake and stream resource productivity. It is likely that a small tarn (i.e., glacial lake) remained in the Donner basin even during the most persistent droughts of the middle and late Holocene. Although isolated from the lake basin, Donner Creek would have risen downstream of the modern outlet as groundwater passed through the unconsolidated sediments of glacial outwash. However, productive fish runs would have been cut off during times when Donner Lake was disconnected from the Truckee system. On the other hand, as the lake receded from the steep valley walls marshlands may have colonized the exposed lake bed.

STRATIGRAPHY

Soil depth and the archaeological deposit at Locus F are moderately deep, extending to100 centimeters below surface in EU 5 and 110 centimeters in EU 2. Four strata that comprise the stratigraphic profile are best illustrated in EU 5 (Figure 11 and Figure 12). The surface soil (Stratum I) is a thin lens of loose dark grayish brown organic rich silty loam with low amounts of sand and gravels. Stratum II, extending from approximately 10 to 50 centimeters below surface, is similar to Stratum I, but more consolidated. The majority of the subsurface artifacts (primarily debitage) were recovered from Stratum II. A distinct change in the subsurface sediments begins in Stratum III. Here, from approximately 50 to 90 centimeters below surface, the amount of sand increases with a concomitant decrease in silt and organics. Sediment color changes to a yellowish brown. Pebbles and cobbles are common. Artifacts in Stratum III (including a high frequency of the tools) were likely mixed down from Stratum II by rodent activity. Stratum IV is yellowish glacial sand that overlays probably multiple lenses of glacial outwash sand and gravels, which are the result of cyclical glacial advances and retreats that affected the Donner landscape (Bloomer and Lindström 2006a:Figure 4).

The Locus G archaeological deposit is primarily contained in a soil package similar to that at Locus F. This is especially true on the relatively flat terrace landform represented by the stratigraphic profiles of EU 1 and EU 2 (Appendix E). The most obvious distinction here is that Stratum IV rises higher in the profile than at Locus F, restricting Stratum III within a slightly thinner band. In addition, the profile for EU 1 provides a glimpse of the decomposing granite substrate (Stratum V) at the very bottom of the archaeological deposit.

Probably the most distinctive subsurface profile within Locus G was exposed in EU 7. EU 7 is situated on a slightly higher landform, essentially an open surface amongst large glacial boulders at the edge of a raised terrace. Stratum I, the typical thin lens of organic rich sediments, does not exist in this profile. Instead, EU 7 stratigraphy begins with Stratum II (Figure 13 and Figure 14), approximately 30 centimeters of very dark gray fine silt with small pebbles. A sediment change occurs in Stratum III as the very dark grayish brown silt becomes increasingly fine and the gravels decrease. A piece of burnt wood lying at 30 centimeters suggests the transitional boundary marks a living surface, probably occupied consistently over a significant time span. This suggestion is supported by the fact that a distinctly diverse and artifact rich tool assemblage was recovered from Stratum III between 40 and 70 centimeters below surface. The artifact assemblage was primarily distinguished by the presence of three *itdemge*. Charcoal collected from below a rock at approximately 50 centimeters below surface was submitted to Beta Analytic for radiocarbon dating. This 14C sample returned a 2300 BP conventional radiocarbon age (Appendix F). Hydration data from the only two obsidian artifacts (debitage) recovered from Stratum III, the only obsidian from the entire EU 7 excavation, returned 5.9 and 4.8 micron values. The radiocarbon date, hydration data and stratigraphy indicate Stratum III holds a buried and relatively intact 5,600 to 2,300 year old artifact assemblage.

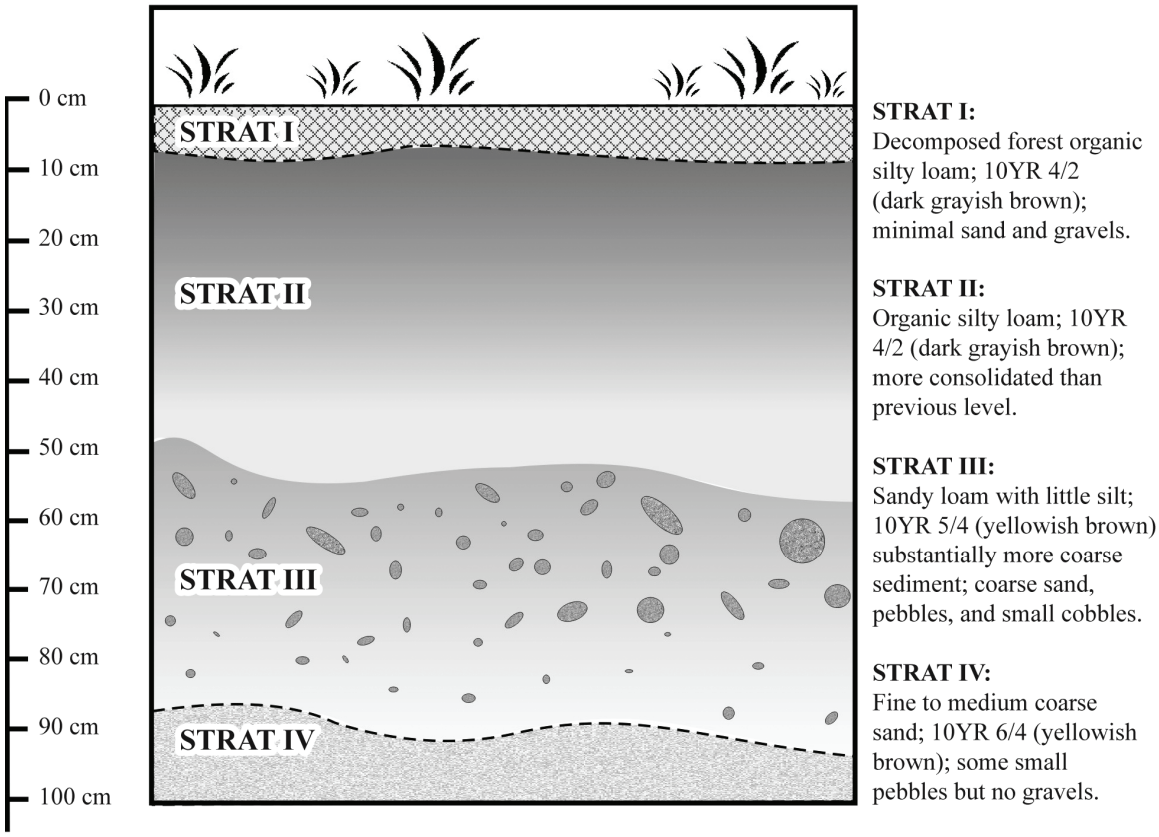

Figure 11. Locus F, EU 5 North Wall Subsurface Stratigraphy.

Figure 12. Locus F, EU 5 North Wall.

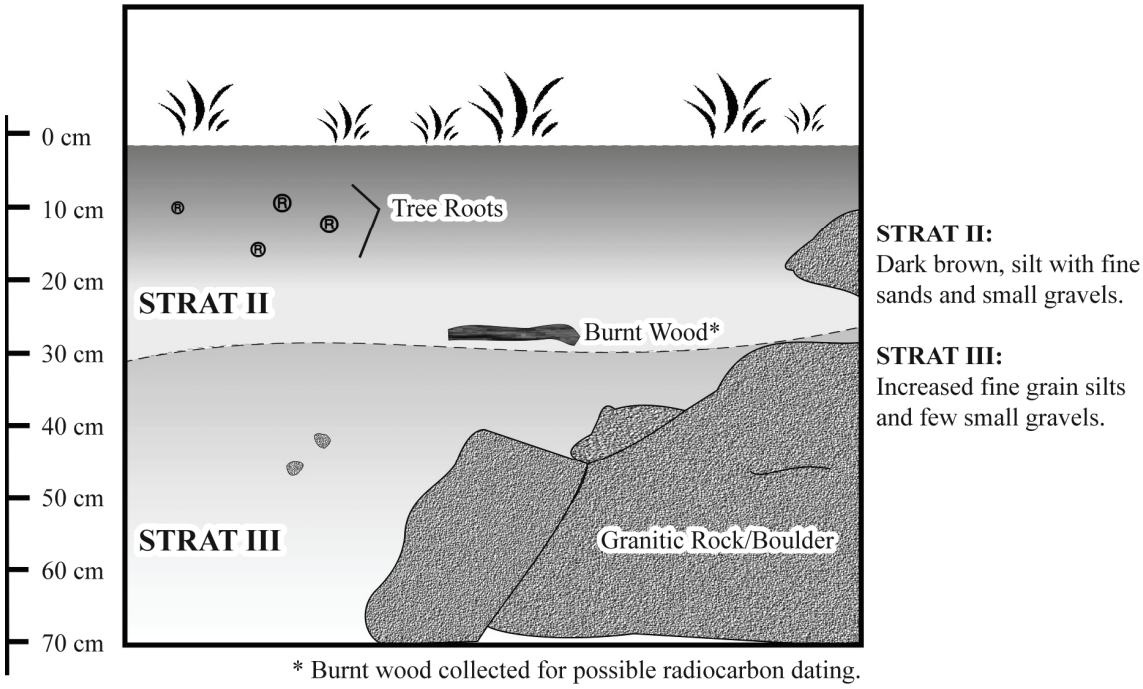

Figure 13. Locus G, EU 7 North Wall Subsurface Stratigraphy.

Figure 14. Locus G, EU 7 North Wall.

SITE STRUCTURE AND ASSEMBLAGE DIVERSITY

Surface investigations at Locus F and Locus G have significantly increased their area dimensions, compared to earlier recordings (Brooke 2005; Gilbert et al. 2001; Schwaderer et al. 1987), essentially encompassing larger portions of their respective landforms. Variable artifact frequencies across each locus indicate at least one prehistoric artifact concentration within Locus F and six prehistoric artifact concentrations within Locus G (see Figure 8 and Figure 9). In addition, two historic artifact concentrations are present within Locus F.

The prehistoric artifact assemblages recovered from excavations at Locus F and Locus G (Table 4) contain a diverse array of tools and debitage reflecting multiple and varied activities that represent long term residential occupations. The high frequency of historic artifacts at Locus F primarily represent activities probably associated with the use of various historic structures located in the Locus F vicinity between 1864 and 1890. Locus G historic artifacts represent either the location of a relatively late historic structure, or a historic dump of structural materials. Historic faunal bone associated with the Locus G structural artifacts might also reflect in situ disposal or secondary dumping.

Table 4. Locus F and G Artifact Assemblages.

	LOCUS F	LOCUS G	TOTAL
Excavated Volume	6.6 m³	7.25 m³	13.85 m³
Projectile Points	5	2	7
Bifaces	19	20	39
Drills	1	1	2
Unifaces	2	3	5
Flake Tools	7	4	11
Edge Modified Flakes	2	4	6
Core	-	1	1
Total Flaked Stone Tools	**36**	**35**	**71**
Debitage	2,199	1,984	4,183
Itdemge	-	3	3
Total Ground Stone Tools	**-**	**3**	**3**
Historic Artifacts	1,710	72	1,782
Historic Faunal Bone	396	11	407

Locus F

Surface investigations between Locus F and Locus F/G (see Figure 8) have discovered a continuous distribution of prehistoric artifacts from Locus F to Locus F/G. Therefore, Locus F/G is not a distinct artifact locus. Locus F/G is probably best considered a prehistoric artifact concentration. Subsurface investigations at Locus F/G (Bloomer and Lindström 2006a) discovered a rich flaked stone assemblage and two shallow buried hearths

sitting on the lee side of low recessional moraine boulders. Given the concentration of artifacts and hearths at Locus F/G in comparison to the relatively wide and differential distribution of artifacts across Locus F (Figure 15)—Locus F/G was probably the main residential activity area in the Locus F vicinity, an inviting setting at the edge of Donner Creek.

Figure 15. Locus F, looking west.

The prehistoric tool assemblages from Locus F and Locus F/G are very similar, primarily characterized by a rich diversity of food and materials processing tools. Hence, it was likely that residential activities took place all across Locus F, not just at Locus F/G. The slightly greater tool diversity at Locus F/G (represented by one core tool and one *gamum*) is probably due to the much larger excavation volume (11.2 cubic meters) that consumed nearly the entire Locus F/G area. At the same time, it appears that flaked stone tool manufacture, including the refurbishing of hunting tool kits, was more frequent across Locus F than at Locus F/G. Given that the excavation volume at Locus F/G was nearly double the excavation volume across Locus F, Locus F debitage and projectile point frequencies are approximately 60% greater than those from Locus F/G.

Historic Concentrations HC1, HC2 and Feature 1

The historic component of Locus F, primarily represented within concentrations HC1 and HC2, is only a small portion of the bigger historic picture within Donner Memorial State Park (Lindström 1987). Schwaderer et al. (1987:7) describes Locus F to contain "domestic trash dating to the mid-nineteenth century and later, and include some Euro-American ceramics and bottle glass, crown caps, tin cans (mostly soldered-seam), cast iron stove parts, window glass (some melted), lumber scraps (some burnt), and cut nails."

Our test investigation of the historic component focused on a surface depression, measuring approximately 24 inches wide by about 8 inches deep, filled with historic artifacts (Feature 1) at the northeastern extent of concentration HC1 (see Figure 8). Excavation of the pit to 50 centimeters below surface (EU1) exposed intact subsurface pit stratigraphy (Figure 16) from 30 to 50 centimeters below surface and recovered 1,681 identifiable artifacts with a MNI of 485. Sediments below the pit strata held relatively few historic artifacts. Although Feature 1 was not identified in the 1987 site record, the historic constituents listed for Locus F are consistent with the items recovered from Feature 1. Table 5 provides a general breakdown of its major artifacts by group.

Table 5. Locus F, Feature 1 Historic Artifact Summary.

PERIOD OF DEPOSITION: 1865-1900			
Excavation Level	**Artifact Percentage**	**Artifact Group**	**Artifact Percentage**
1 (0-10 cm)	40%	Domestic	2%
2 (10-20 cm)	35%	Consumptive	39%
3 (20-30 cm)	21%	Structural	58%
4 (30-40 cm)	4%	Personal	<1%
5 (40-50 cm)	<1%		

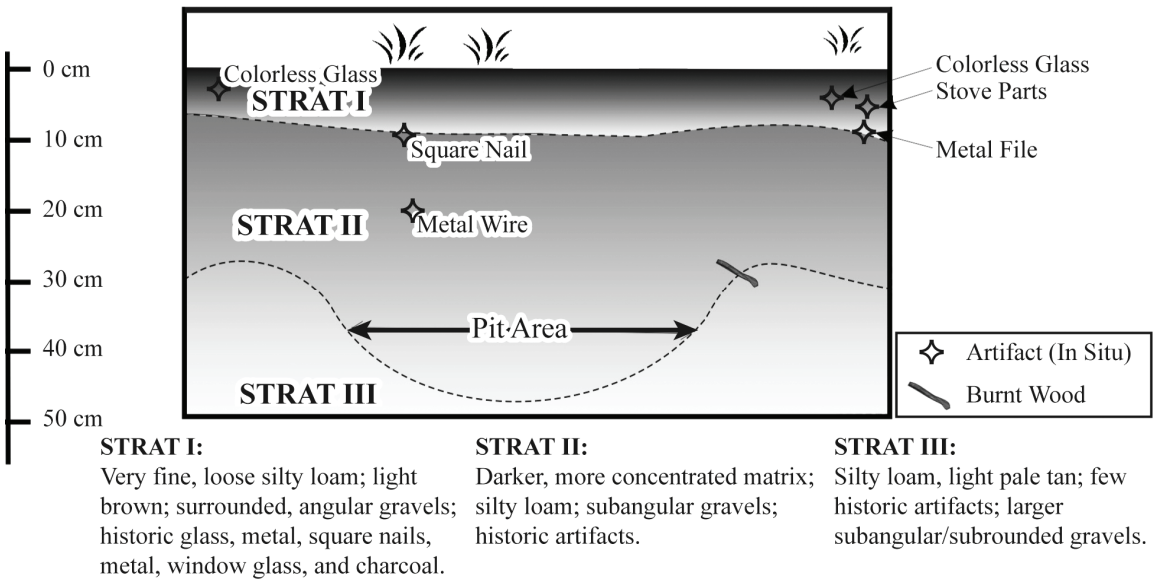

Figure 16. Locus F, EU1 North Wall, Subsurface Pit Feature Stratigraphy.

Locus F is referred to as the "East End Settlement." Newspaper accounts and assessor's records from 1864 to 1866 describe several businesses and buildings at the eastern end of Donner Lake (Lindström 1987:25–28). An 1870 map depicts four buildings, including the Donner Lake House (a hotel), in the vicinity of Loci A, E and F, and the 1856–1866 General Land Office Plat map identifies two of these structures—the Donner Lake House and McPhearson's barn—in the same vicinity. The historic artifact concentrations in Locus F, including the featured pit (F1), may be related to activities associated with one or more of these structures. The fragmentary condition and charring of the artifacts suggest that the pit feature (F1) likely represents a single-event disposal site, sometime between circa 1865 and 1890.

Locus G

Locus G covers a large area immediately south of Locus F, on the south side of Donner Creek (see Figure 3). Prehistoric artifact concentrations C1, C2 and C3 are relatively large with their dimensions defined by good visibility of surface artifact distributions (see Figure 9). Small concentrations C4, C5 and C6 are in areas of poor surface visibility. Hence their dimensions are less certain. Regardless of size, five of the six prehistoric artifact concentrations (C2–C6) contain similar artifact assemblages. Surface survey, surface excavations and subsurface excavations in concentrations C2–C6 recovered a predominance of basalt debitage with a few bifaces indicating an emphasis on basalt tool manufacture at each of these locations.

In contrast, surface survey and subsurface excavations in concentration C1 recovered a diversity of artifacts (similar to the Locus F assemblage, see Table 3) indicating C1 was the primary residential activity area within Locus G. Concentration C1 covers a low rise amongst granitic boulders (Figure 17). The forest (today) is sparse and the ground is open. Low granite bedrock boulders to the northeast and southeast (*Lam* 1 and *Lam* 2; see Figure 9) were used as permanent bedrock milling stations. Three *itdemge* (portable millingstones) were found within concentration C1, EU 7, at 40 to 60 centimeters below surface.

Figure 17. Locus G, Concentration 1, looking southeast.

EU 7 stratigraphy (discussed under Geomorphology and Stratigraphy) suggests a living surface was present at 30 centimeters below the modern ground surface that may have existed for a significant time span. The whole *itdemge* (158) found below 40 centimeters probably was used on that living surface, while two small *itdemge* fragments found below 50 centimeters probably represent down churning of artifacts that were once on the surface. Radiocarbon and hydration data indicates the deposit below 30 centimeters could be 5,600 to 2,300 years old.

Lam *1 and* Lam *2*

Lam 1 is a single granitic boulder measuring 1.7 meters (NW/SE) by 1.75 meters (NE/SW) and rises 10 centimeters above the modern ground surface (Figure 18). This *lam* shows extensive use, represented by two mortars and four milling slicks (Figure 19). The mortars are relatively shallow. Mortar 1 is 2.2 centimeters deep and Mortar 2 is 3.5 centimeters deep. The milling slicks show moderate use, represented by smooth polish on flattened facets, but pecking is not apparent. Milling slicks 4 and 5 have depths of 0.4 and 0.2 centimeters, respectively, which are primarily due to grinding on the naturally undulating rock surface.

Lam 2 is a single granitic boulder measuring 2.1 meters (W/E) by 1.5 meters (N/S), rising 18 centimeters above the modern ground surface (Figure 20). This *lam* is less used, with only one relatively small mortar and one milling slick (Figure 21). Mortar 1 is 1.1 centimeters deep. The grinding surface of milling slick 2 is primarily west of the mortar cup. Slick polish encircling the mortar cup may represent more of a multiple activity surface than a grinding surface, smoothed and polished over time from varied use.

ARTIFACTS

The prehistoric artifact collection (Table 6) includes 71 prehistoric flaked stone tools, 4,183 debitage and three groundstone tools. Historic artifacts (Table 6) include 1,753 items identified by type and 29 unidentified. There are also 407 historic faunal bone. Provenience, technological data and metric dimensions for flaked and ground stone and faunal remains are listed in Appendix C Tables. Prehistoric artifacts from Locus F and Locus G are described together by type. Historic artifact descriptions are grouped by provenience.

Table 6. CA-NEV-13/H Test Locus F and G Prehistoric and Historic Artifact Counts.

	LOCUS F	LOCUS G	TOTAL
Prehistoric Artifacts	2,235	2,022	4,257
Historic Artifacts	1,710	72	1,782
Historic Faunal Bone	396	11	407
Total	**4,341**	**2,105**	**6,446**

Prehistoric Artifacts

Flaked stone comprises the vast majority of the prehistoric artifact collections from Locus F and Locus G (Table 7). Groundstone artifacts, all *itdemge*, were only recovered from one excavation unit in Locus G, Concentration 1.