

Under the Mazama Ash: Results of Data Recovery Excavations at the Crescent Lake Site (35KL749)

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Since 2016, the Crescent Lake Resort in Klamath County, Oregon has been undergoing updates to its infrastructure. The resort is situated on top of a large, stratified, multicomponent prehistoric site, with occupations both pre-dating and post-dating the eruption of Mount Mazama over 7,000 years ago. In order to mitigate impacts from utility system upgrades, Logan Simpson conducted data recovery excavations in 2018 at the site in response to a Section 106 project within the Deschutes National Forest. This work resulted in the recovery of over 10,000 prehistoric artifacts, and the excavation of two buried prehistoric features, including a pre-Mazama single reduction locus and a post-Mazama thermal feature. This paper explores the results of artifact and feature analyses, including typologies, radiocarbon dates, obsidian studies, and blood residue analysis. All of these factors have been compared between the pre- and post-Mazama components in order to evaluate changes in site occupation over time.

The Crescent Lake site (35KL749) in Klamath County, Oregon (Figure 1), has been the primary focus of archaeological investigations at Crescent Lake since the site's original recording by Sandra Lee Snyder in 1982 due to the presence of an extensive surficial deposit of cultural materials and the presence of two buried cultural components—Component I and Component II (Mulligan 1997; Gray and Tonsfeldt 2008). Component I is a post-Mazama surface manifestation evidenced by a moderate scatter of lithic debitage, expedient and formal tools, and groundstone. This material is exposed on the surface, eroding from terraces and creek cut banks, and is buried, in undisturbed areas, under pine needle duff and the thin humus (5-10 centimeters) built up on the pumice deposit since the eruption of Mt. Mazama in ca. 6845 BP. Testing at the site has shown Component I is found within the Mazama deposits to a minimum depth of 80 cmbs (centimeters below the surface). Downward movement of cultural material through the soil profile is thought to be a function of the unconsolidated nature of the Mazama tephra, and natural processes of bioturbation (plant and animal behaviors) and cryoturbation (freeze-thaw cycles). The relative age assessment for Component II is based on the original air-laid Mazama ash deposit

approximately in 6845 cal BP. This component is relatively undisturbed due to its location below the thick Mazama ash mantle. It has been exposed only where deep intrusions such as building foundations and septic tanks are situated.

Initial documentation of archaeological resources at Crescent Lake, including 35KL749, began in the late 1970s and early 1980s (Snyder 1982). Seven sites were recorded along the lakeshore within the drawdown zone and six sites recorded above the high-water mark (Snyder 1982; Gray and Tonsfeldt 2008:15; Mulligan 1997:121). These sites were later revisited in 1988 by Goodman (1988). Multiple testing and monitoring projects conducted at 35KL749 between 1986 and 2015 have documented sub-surface archaeological deposits up to two meters below the surface. Approximately twenty-two square meters of the site's surface area were tested prior to 1997 and the results of these investigations served as the material for an Oregon State University master's thesis (Mulligan 1997). Mulligan's (1997) research at 35KL749 analyzed 240 formed lithic tools and over 20,000 pieces of lithic debitage. Additional analysis included charcoal, fire-cracked rock, faunal remains, baked clay, ochre, a single human mandible, and over 1,300 historic-period artifacts (Gray and Tonsfeldt 2008; Mulligan 1997:165-66).

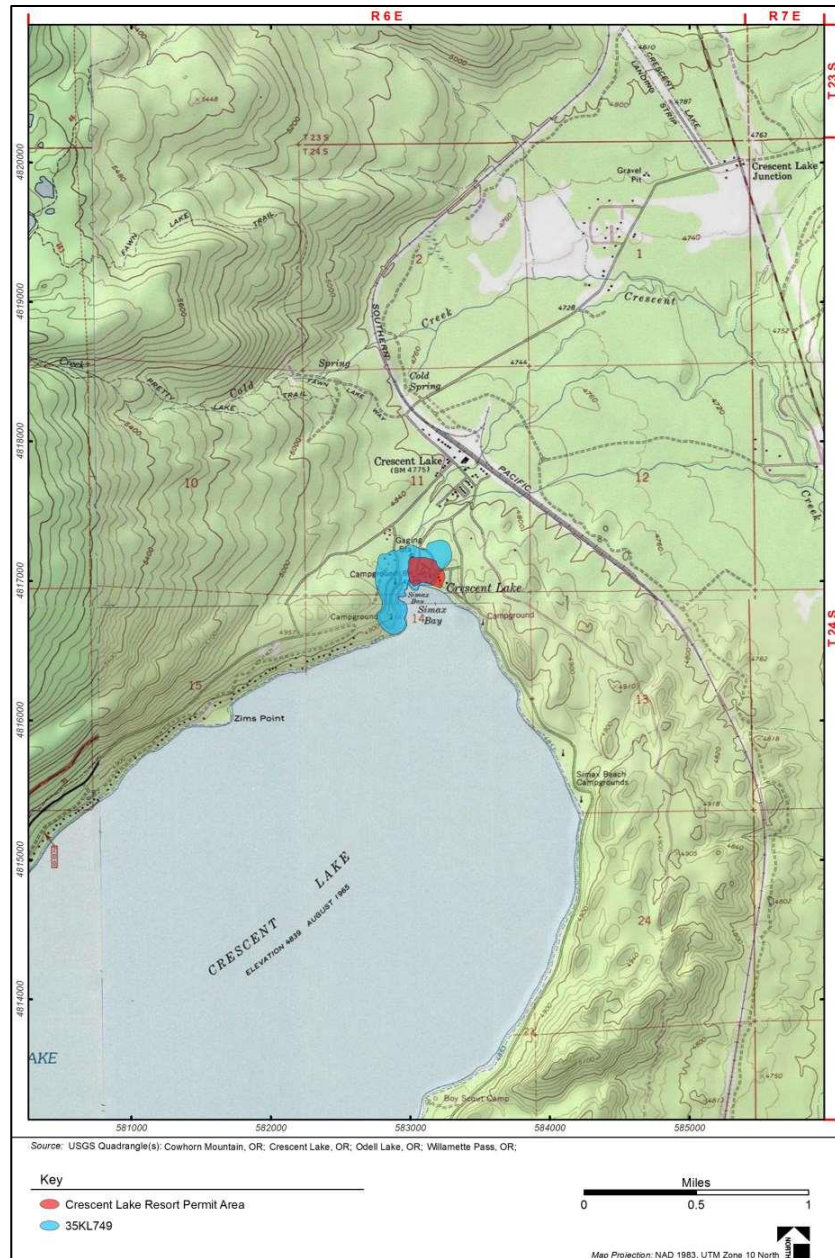


Figure 1. Location of the Burnett site (35CL96) near the Willamette River, Lake Oswego, Oregon.

A total of 72 projectile points or point fragments were identified by Mulligan in the assemblage. Of the classifiable points, all originated during the post-Mazama era, and are associated with projectile point styles common to the Great and Klamath basins (e.g., the Humboldt, Elko, Rose Springs, Eastgate, and Gunther series). Other chipped stone tool categories include bifacial knives, scrapers, drills, graters, edge-modified flakes, and utilized flakes. Ground stone and cobble tools in the assemblage

included grinding slabs, edge ground cobbles, and a single hammer stone (Mulligan 1997:166-186). Obsidian sourcing results for analyzed pre-Mazama specimens identified quarry sources at Silver Lake/Sycan Marsh, Newberry volcano, McKay Buttes, and Quartz Mountain; post-Mazama sources included all of the above except Quartz Mountain with additional source locations at Cougar Mountain and Obsidian Cliffs. A single pre-Mazama radiocarbon date of 7140 $\pm$ 100 BP was obtained

from cultural bearing paleosols (Mulligan 1997:203 and 207). Mulligan also noted that at least 95 percent of the artifacts recovered were manufactured from obsidian, while the remainder were manufactured using crypto-crystalline silica (CCS) of assorted varieties as well as andesitic basalt. Based on the artifact assemblage, Mulligan concluded that the occupants of 35KL749 were likely small groups of mobile foragers who frequented Crescent Lake on a seasonal basis. Throughout the Holocene, Crescent Lake appears to have been a popular upland destination for a range of seasonal hunting, gathering and processing activities (Gray and Tonsfeldt 2008; Mulligan 1997).

Since Mulligan's extensive study of 35KL749, USFS archaeologists have conducted multiple small testing projects between 1994 and 2008 prior to various improvements made by the Crescent Lake Resort (Hickerson 2001 and 2002; Gray and Tonsfeldt 2008). Logan Simpson conducted two phases of archaeological investigations in 2015 to mitigate the removal and installation of a septic tank/grease trap at Crescent Lake Resort (Willis 2016). A total of 1,888 artifacts were recovered during data recovery, including three projectile points, four ground stone fragments, a biface

fragment, and 1,852 flakes.

In 2018, Logan Simpson completed additional data recovery excavations to mitigate the installation of new septic tanks and sewer line trenching. The latest testing efforts included excavation of 33.8 cubic meters of sediment within 17 test units (TUs) as well as monitoring tasks. Data recovery resulted in the identification of buried cultural materials up to a depth of 210 cmbd. In some places, archaeological materials were observed to be vertically disturbed from the ground surface to 200 cmbd due to past septic tank trenching and utility placement; however, in general, archaeological deposits recovered below 90 cmbd in the majority of test units were undisturbed. Two cultural features were identified during monitoring activities: a post-Mazama thermal feature and a historic-period trash pit dating to the 1920s.

The stratigraphic relationships at the site, schematically shown in Figure 2, indicate surface soils along Crescent Lake and throughout the site are underlain by thick, inverse-graded climate pumice debris-fall, fine ash, and lapilli pyroclastic deposits associated with the Mt. Mazama eruptive event at ca. 6845 cal BP; a regional chronostratigraphic marker.

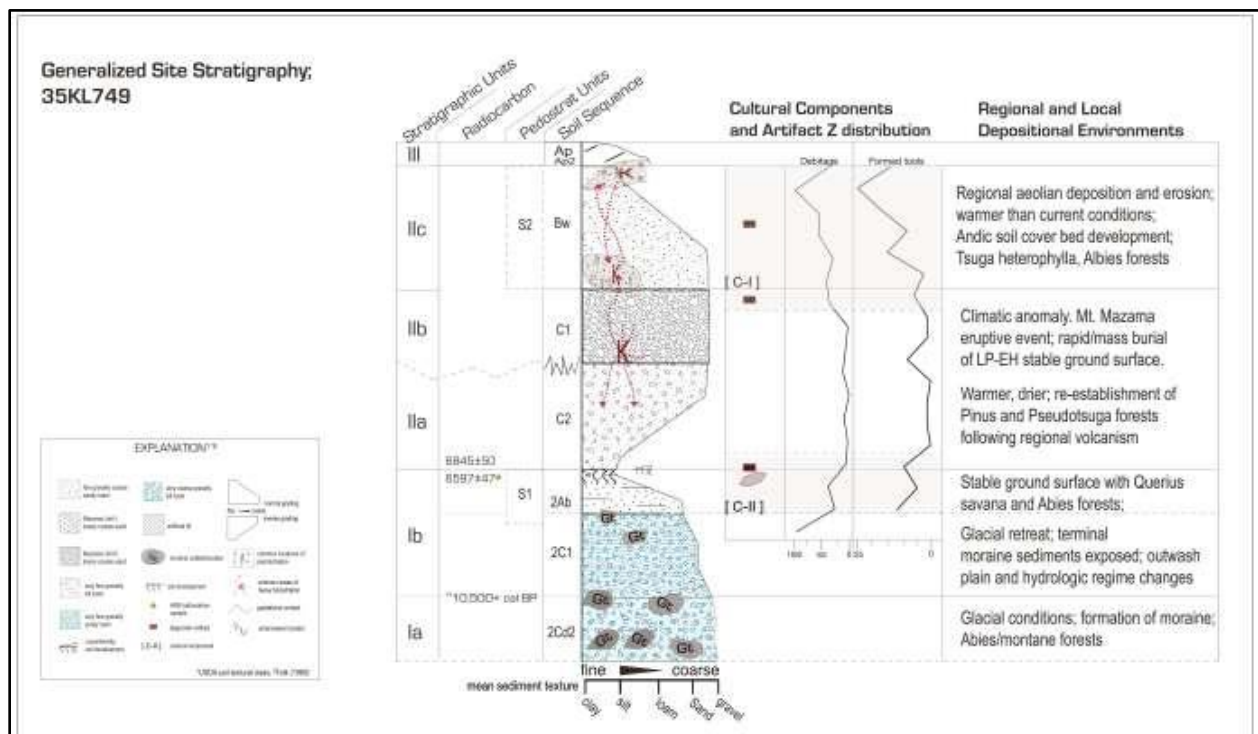


Figure 2. Schematic profile of generalized stratigraphy across site 35KL749.

Massive and poorly sorted volcanic deposits rapidly buried an early Holocene stable ground surface forming an unconformable contact identified in test units with intact, non-pedoturbated stratigraphy. The buried soil (i.e., former early Holocene ground surface) is extensive and represents an extended period of environmental and landform surface stability established at some point following the retreat of the terminal moraine during the Late Pleistocene-Early Holocene period. Those buried soils observed within 16 TU profiles appear to be pre-Mazama or early Holocene in age based on the depth and moderate degree of soil development, as well as the overlying Mazama soil horizons. Identified buried soils correlate vertically and horizontally and suggest a sustained period of former landform stability following glacial moraine retreat, which allowed subsequent pedogenesis (i.e., soil formation) to occur regionally. Similar geoarchaeological findings of periodic pre-Mazama—early Holocene age landform stability have been recorded along Odell Lake and in the Newberry Caldera areas of the High Cascades and Central Oregon region (Jaehing 1994; Mulligan 1997; Connolly 1999; Willis 2017; Figure 2).

Prior dating has been limited to projectile point typologies and a single pre-Mazama radiocarbon date of 7,140 BP $\pm$ 100 years obtained from a cultural-bearing paleosol in 1996 (Mulligan 1997:203 and 207). Previous typological dating included identification of Western Stemmed and Great Basin Stemmed projectile point types, suggesting an early occupation during the Late Pleistocene–Early Holocene transition, and foliate point types associated with the succeeding Cascade phase of the Early Holocene (Mulligan 1997; Willis 2016). Based on the most recent analyses conducted following the 2018 data recovery excavations, at least two major occupational horizons (Component I and Component II) were identified, which represent occupations beginning in the Late Pleistocene-Early Holocene transition and spanning the Archaic and into the historic-period following a hiatus in site occupation after the Mt. Mazama eruptive episode. Two charcoal samples were submitted for AMS radiocarbon dating and returned dates of approximately 7,549 to 7,458 BP for pre-Mazama Component II deposits in TU-3, which corresponds with the Early Archaic period, and approximately 1,050 to 976 BP for post-Mazama Component I

deposits in the thermal feature, which corresponds with the Late Prehistoric period.

Diagnostic projectile point types identified in Component I and Component II assemblages are similar to those from other well-dated Early Holocene high lake sites in the region, including the Odell Lake Site (35KL231) (Stuemke 1985; Figure 3). Rose Springs, Elko, Desert Side Notch, and Gatecliff point types were recovered above Mt. Mazama tephra and pumice deposits, and are consistent with Middle to Late Holocene post-Mazama occupations of the site (Justice 2002). A single Cascade-like foliate point was recovered from in situ pre-Mazama deposits in TU-9 and is associated with the Early Holocene occupation of the site. Additionally, a small Great Basin Stemmed point was recovered from a highly disturbed context in TU-1, but likely represents vertical displacement from the pre-Mazama paleosol. The possible Lake Mohave point is associated with a Late Pleistocene—Early Holocene occupation of the site (Justice 2002). The overall increase in projectile point density and types during the post-Mazama occupational period demonstrates increased utilization of the site during this time.

The total assemblage of lithic tools and debitage from 35KL749 (n=10,413) suggest that the site likely functioned as an upland seasonal camp for hunting and processing, but it also functioned, in part, as a workshop for stone tool production and maintenance. Lithic reduction focused on the production of bifaces and projectile points, as well as maintenance and sharpening of tools. The density of lithic artifacts varied throughout the site. The greatest artifact densities occurred in the south/southeastern portion of the site near the main lodge within TU-1 and TU-16. TU-16, located immediately east of the main lodge patio, accounted for 17 percent (n=1,711) of the total lithic artifacts recovered. TU-7, where the degree of disturbance was considerably higher in upper lying sediments than at other TU locations, accounted for less than 1 percent (n=43) of the total lithic artifact assemblage. There is some degree of horizontal variation in the frequencies of prehistoric artifacts and artifact classes, especially along Crescent Creek, but in general, the distributions in these higher density units suggests little potential to identify patterns indicative of discrete activity areas. This is likely an indication of relatively homogenous upland



Figure 3. Select projectile points and point fragments recovered from 2018 data recovery at 35KL749.

landform use during all periods of prehistoric site occupation. On a whole, the prehistoric artifact assemblage represents a palimpsest of repeated short- to long-term occupations over a period of about 8,000 years.

The types of lithic raw materials used for stone tools are typical of most sites in the region and east of the Cascades. Like most sites in this area, there was a heavy reliance on obsidian materials (about 98 percent total). The use of black obsidian as a material type in the Component I assemblage (n=3135) is roughly 30 percent higher than in the Component II assemblage (n=936). In comparison, the use of gray obsidian in the Component II assemblage (n=2078) is roughly 52 percent higher than in the Component I assemblage (n=1088). The reasons for the apparent increase in the use of black obsidian during Component I is not well understood. An increase in population coupled with proximity and accessibility to raw material sources may have resulted in an increase of transported black obsidian to the site over time. Samples of gray obsidian used during the pre-Mazama occupation have been traced to McKay Butte and a Medicine Lake Volcano geochemical group consisting of the Grasshopper Flat, Lost Iron Well, and Red Switchback (GF/LIW/RS) obsidian source localities (Figure 4). Samples of gray obsidian used during the post-Mazama occupation

appear to have originated at Newberry Volcano and Silver Lake/Sycan Marsh (Figure 4).

Obsidian source data can be useful in identifying home ranges, procurement areas and trade networks of peoples occupying a particular site location. In the case of Site 35KL749, however, it is unknown if the people who occupied Crescent Lake obtained these materials directly from source areas or whether they obtained their lithic supplies elsewhere through trade. Source areas in the High Lava Plains are relatively close to the site, approximately 56 km to the northeast of Crescent Lake, while the source area in northeastern California is located 217 km south of the site and seemingly indicates procurement through long-distance trade. It is possible that some source materials in the site assemblage may have been previously lost or abandoned elsewhere by some groups, only to be scavenged and used by others during their respective travels through the central Oregon region. It is conceivable that, over time, lithic materials obtained in this manner may have been brought into and ultimately discarded at Crescent Lake.

Other raw material types, such as cherts, basalts, and FGV, are present in both Component I and II artifact assemblages but are rare, which suggests that sufficient workable supplies were harder to procure. Chert in the form of debitage (n=96) and tools (n=7)

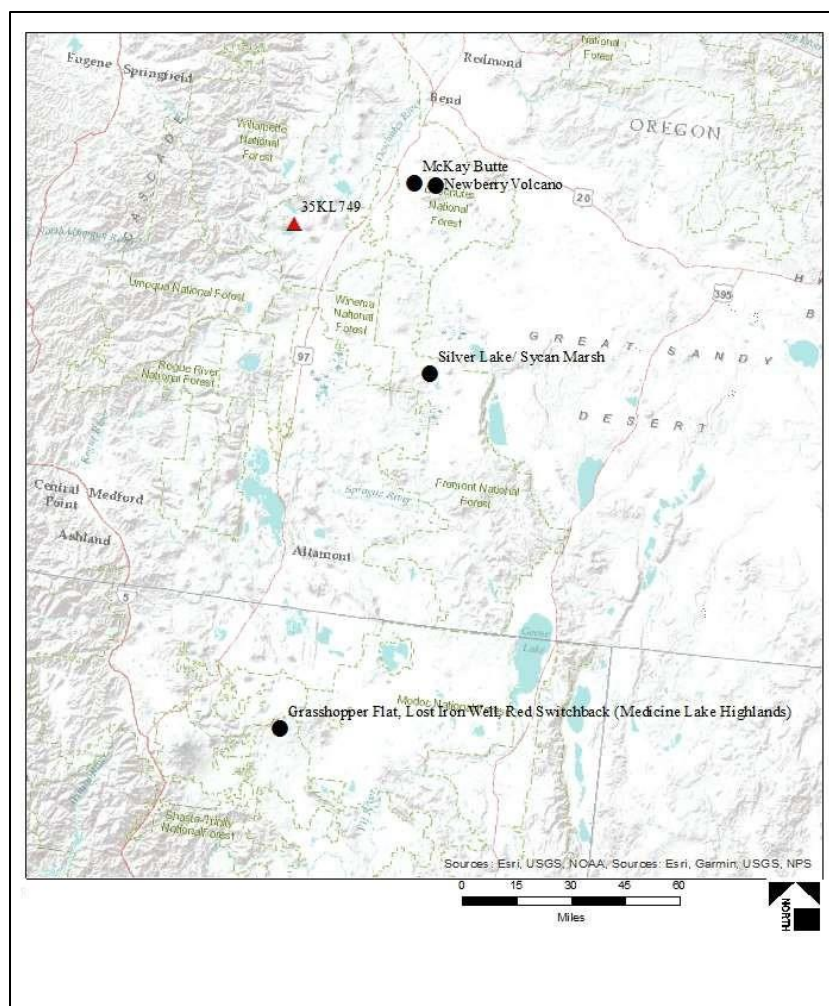


Figure 4. Gray obsidian source localities in relation to site 35KL749.

represented less than 1 percent of the entire lithic assemblage. Red chert was dominant but other varieties included white, black, and speckled. The pre-Mazama artifact assemblage is characteristic of Early Holocene sites in that fine-grained volcanic material, primarily in the form of andesitic basalt, represented about 1 percent of the entire assemblage and included both debitage (n=107) and tools (n=27). This material type may have been locally procured based on the considerable number of basaltic groundstone (n=18) at the site, which included manos, metates, pestles, a grinding slab fragment, and an abrader.

Results of the debitage analysis for Component I and Component II suggests that the initial reduction of cores largely took place off-site at the material source. The greater numbers of late-stage flakes compared to the low number of core reduction flakes

across the site reflects the importance of on-site bifacial tool production rather than core reduction. The paucity of cores and hammerstones identified at the site suggests that percussion bifacial reduction may have been done with antler batons or curated hammerstones. Based on attributes of the recovered cores, a multidirectional core reduction strategy was primarily employed at the site. Multidirectional core reduction was indicated by multiple platforms and negative flake scar orientations on all six of the recovered cores. The overall lack of cortex suggests that few raw materials were procured near the site. At this site and other well-dated highland lake sites in the Central Cascades, obsidian is typically represented by later stages of production. This suggests that by the time obsidian entered the area, it was as pre-manufactured bifacial blanks, preforms, or as completed tools. A pre-Mazama

late-stage reduction event was captured in TU-12, with a single reduction locus identified between 120 and 130 cmbd and consisting of over 500 pieces of secondary and tertiary gray obsidian flakes. This obsidian was sourced to a Medicine Lake Volcano geochemical group consisting of the GF/LIW/RS obsidian source localities. This source is located roughly 217 km south of the site, a significant geographical distance in which the gray obsidian preform may have moved as a commodity.

Differences observed in assemblage diversity suggest that pre-Mazama and post-Mazama populations used Crescent Lake and the surrounding upland lake system for similar purposes, but the intensity of task specific activities increased as higher populations likely occupied the area during the Middle to Late Holocene. Cultural material drops appreciably within the C1 and C2 horizons and likely corresponds to a hiatus in site occupation and the surrounding region due to environmental degradation following the Mt. Mazama eruptive episode. The site was likely reoccupied following the restoration of mountain ecosystems during the Middle Holocene considering multiple pre-3,000 BP age estimates associated with post-Mazama components from surrounding sites, namely Odell Lake. Overall technological organization, in terms of assemblage diversity and tool types, appear to be similar for pre-Mazama and post-Mazama occupations. However, measurable differences exist between Component I and Component II, and

include raw material use, projectile point morphology, artifact density, and debitage composition.

Results of the formal tool analysis suggest similar activities occurred during Component I and Component II occupations. Evidence for processing resources is represented in both components. Groundstone—likely used for plant processing of pulpy foods or hides—is present in Component I and Component II assemblages; however, the highest concentration of groundstone was recovered from mixed deposits during monitoring. The presence of a cobble chopper at the site suggests a variety of chopping and pounding tasks took place for processing wood and animal products (e.g. butchering and bone marrow extraction). The concentration of groundstone tools adjacent to Crescent Creek, although found in mostly disturbed contexts due to the construction of Crescent Creek Dam, may reflect a special-activity area focused on resource processing.

Macrobotanical samples collected from a large post-Mazama thermal feature (Figure 5), radiocarbon dated to 1,050 to 976 BP, included pieces of conifer charcoal, likely Douglas-fir (*Pseudotsuga menziesii*), Douglas-fir needles and fragments, charred sedge seeds (*Scirpus sp.*), wild rose (*Rosa nutkana*) seeds, mustard (*Brassicaceae*) seeds, unidentified inflorescence, likely Asteraceae, as well as possible sinew and microdebitage in the form of obsidian and chert flakes.



Figure 5. Overview of a post-Mazama thermal feature, radiocarbon dated to 1,050 to 976 BP.

No evidence of plant processing activities were found in association with the feature.

A higher amount of formal, steep-edged modified flakes are also present in the Component I artifact assemblage, which indicates that animal hide processing was a dominant activity at the site during post-Mazama occupations. Both components include non-formal modified flakes, but with Component I containing about 80 percent more compared with Component II. Bifaces are present in both components, with a predominance of late-stage fragments, some of which are likely from finished projectile points. However, many of these are missing the proximal ends or potential haft elements. Some of these biface fragments exhibit evidence of bending fractures that occurred during the final stage of the manufacturing sequence, or possible impact breakage. The Component I assemblage has about 75 percent more biface fragments than Component II assemblage.

Decorative items, such as the partially perforated basalt pebble identified as a possible unfinished bead, have social implications and may have been obtained through trade; however, considering the significant amount of fine groundstone artifacts likely manufactured on-site, the pebble was probably modified sometime during a pre-Mazama occupation and discarded. Occasional stone beads are found at early Holocene coastal sites in the Pacific Northwest but are not well-represented in High Cascade sites.

In general, the lithic assemblage at site 35KL749 supports evidence for a similar use by pre-Mazama and post-Mazama populations, with increased utilization from the Middle to Late Holocene. Hunting and gathering, and processing of plants were a common theme and may suggest a cultural continuity in terms of upland land use in this mountain lake system. Fishing was also an important activity at the site, as indicated by a post-Mazama obsidian projectile point midsection that tested positive for trout antisera, which cross reacts with native species such as steelhead trout and chinook salmon. Toolkit diversity, cultural stratigraphy, and pedostratigraphy records correlate well with results of investigations from the surrounding mountain lake system—Odell Lake and Davis Lake among others—and represent a valuable human land use record spanning the Late Pleistocene–Early Holocene transition through Late Holocene periods. This High Cascades upland lake system is

archaeologically unique in that multiple site areas include extensive temporal records of prehistoric occupation facilitated by the common presence of paleosols underlying the Mt. Mazama chronostratigraphic marker.

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