Title

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Journal

Journal of California and Great Basin Anthropology, 35(1)

ISSN

0191-3557

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Publication Date

2015

Peer reviewed

Journal of California and Great Basin Anthropology | Vol. 35, No.1 (2015) | pp. 99–112

Evaluating the Stratigraphic and Chronological Integrity of the Last Supper Cave Deposits

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Located in northwestern Nevada, Last Supper Cave was tested in 1968 and fully excavated in 1973–1974 under the direction of Thomas Layton. The site revealed a long sequence of human occupation, including a Paleoindian component initially dated to ~9,000–8,000 radiocarbon years ago (B.P.). In 2008, a hearth from the lowest deposits returned an AMS date of 10,280±40 B.P., suggesting that initial occupation occurred during the latest Pleistocene, over a millennium earlier than initially believed. Here we present the results of further AMS dating of the Last Supper Cave deposits and an analysis of the vertical distribution of time-sensitive projectile points in order to evaluate the site's stratigraphic integrity. Results indicate that while some portions of the deposits were mixed, others appear to have been relatively intact, and materials recovered from them hold great potential for future research.

Last Supper Cave (LSC) is located in the rugged High Rock Country of northwestern Nevada, where volcanic tablelands with deeply-incised canyons are more typical than the basin-and-range topography that characterizes other parts of the Great Basin. The cave is large, measuring ~30 ft. (~9 m.) wide at its mouth and ~70 ft. (~21 m.) deep (Figs. 1 and 2). Sediment within LSC is a mix of rockfall, aeolian silt and tephra, exogenous organic material introduced by humans and woodrats, and towards the cave's front, colluvium (Layton and Davis 1978). The site, which contained a series of surface rock enclosures and artifacts when initially recorded, was tested in 1968 and completely excavated in 1973–1974 under the direction of Thomas Layton (Layton 1970, 1977, 1985; Layton and Davis 1978). The project involved 5-ft.^{2} (~1.5 m.^{2}) units that were excavated according to both natural strata and arbitrary levels (generally 3-6 in. [~7.5–15 cm.] deep), using trowels. Most artifacts were recovered *in situ* and their three-point proveniences recorded; artifacts not found *in situ* were recovered from 1/8-in. screens. Time-sensitive projectile points, ranging from Great Basin Stemmed to Desert Side-notched types, suggested that LSC was occupied throughout much of the Holocene, and when considered together with the abundant lithic artifacts, well-preserved subsistence residues, sandals and baskets, and coprolites that were also recovered, it quickly became clear that LSC held great potential to address questions about human behavior and how it varied across time.

Despite this potential, a full site report was never completed. An incomplete, unpublished, and widely

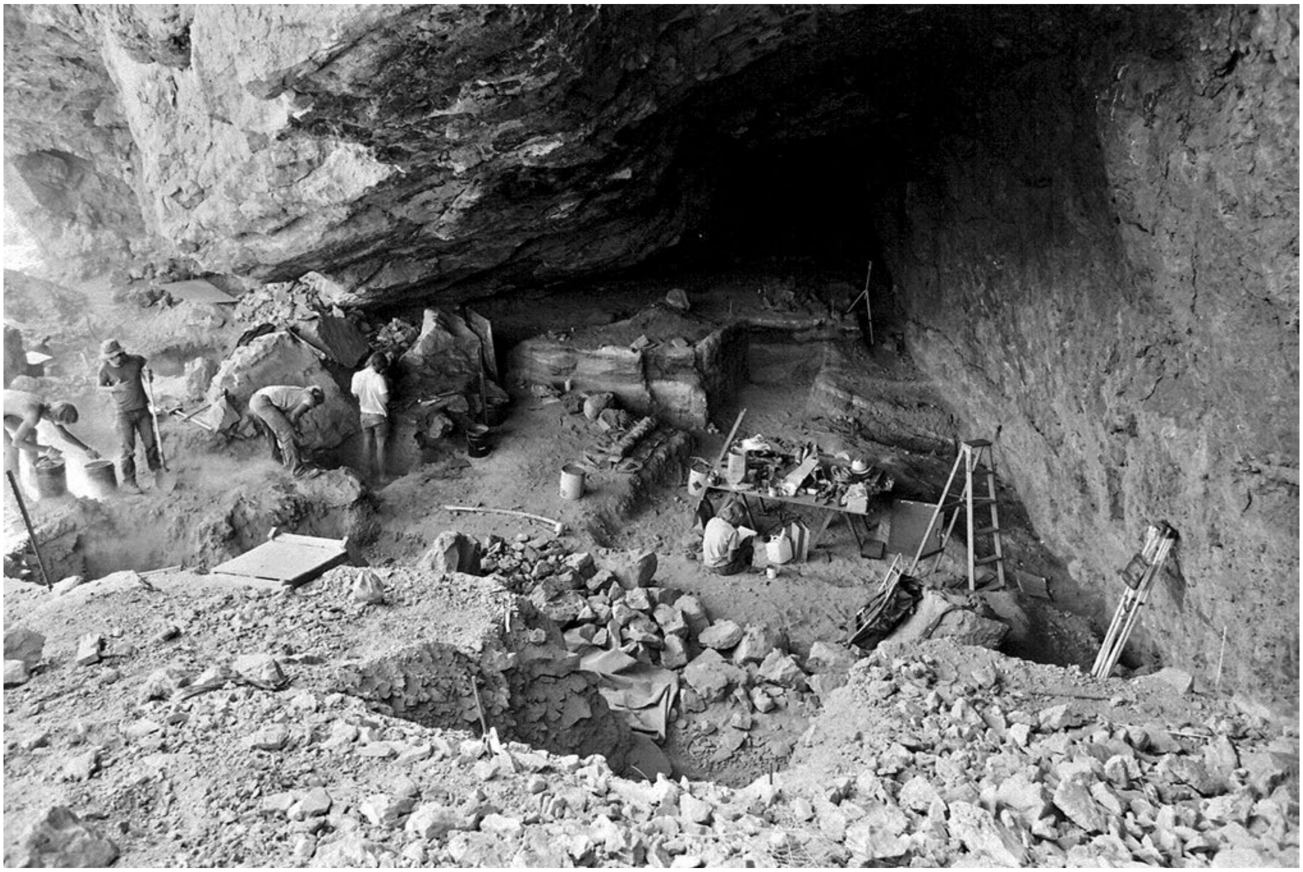


Figure 1. Overview of Last Supper Cave during 1974 field season. Photo courtesy of Tom Layton.

circulated manuscript by Layton and Davis (1978) is the greatest source of information about the site and offers an overview of its location, environmental setting, and stratigraphy, as well as information about the site's Paleoindian flaked stone tool assemblage. Work with the LSC collection has proceeded in a mostly piecemeal fashion over the years. Additional analyses of materials have included Grayson's (1988) faunal study, Smith's (2008, 2009, 2010; Smith and Kielhofer 2011) geochemical characterization of Paleoindian and Archaic obsidian artifacts, Smith et al.'s (2013) direct dating of projectile points containing remnants of organic hafting material, Grant's (2008) dating of macrobotanical remains, and Taylor and Hutson's (2012) coprolite analysis. While these efforts have improved our understanding of the site's occupational history and contributed to broader studies of Great Basin prehistory, a synthesis of radiocarbon dates from LSC has yet to occur. Towards that goal, we have compiled all the radiocarbon dates from the site, and—together with an analysis of the vertical distribution of time-sensitive projectile points—use them to assess the stratigraphic integrity of the deposits. While these datasets suggest that some deposits were likely mixed, others appear to have been relatively intact, and therefore offer the potential for future research opportunities using a robust and diverse artifact assemblage.

STRATIGRAPHY AND CHRONOLOGY

During the 1968 and 1973 excavations directed by Layton, the site's strata were grouped into seven major "field stratigraphic units" (Layton and Davis 1978) on the basis of lithology and color (Table 1 and Fig. 3). The lowest of these stratigraphic units, the culturally-sterile "Pink Zone," was a bright-pink clay loam ~7 ft. (~213 cm.) thick in most parts of the cave. This stratum likely resulted from the weathering of tuffaceous sediments exposed during the formation of the cave. Overlying the Pink Zone was the "White Zone," a 2–3.5 in. (~5–9 cm.) thick

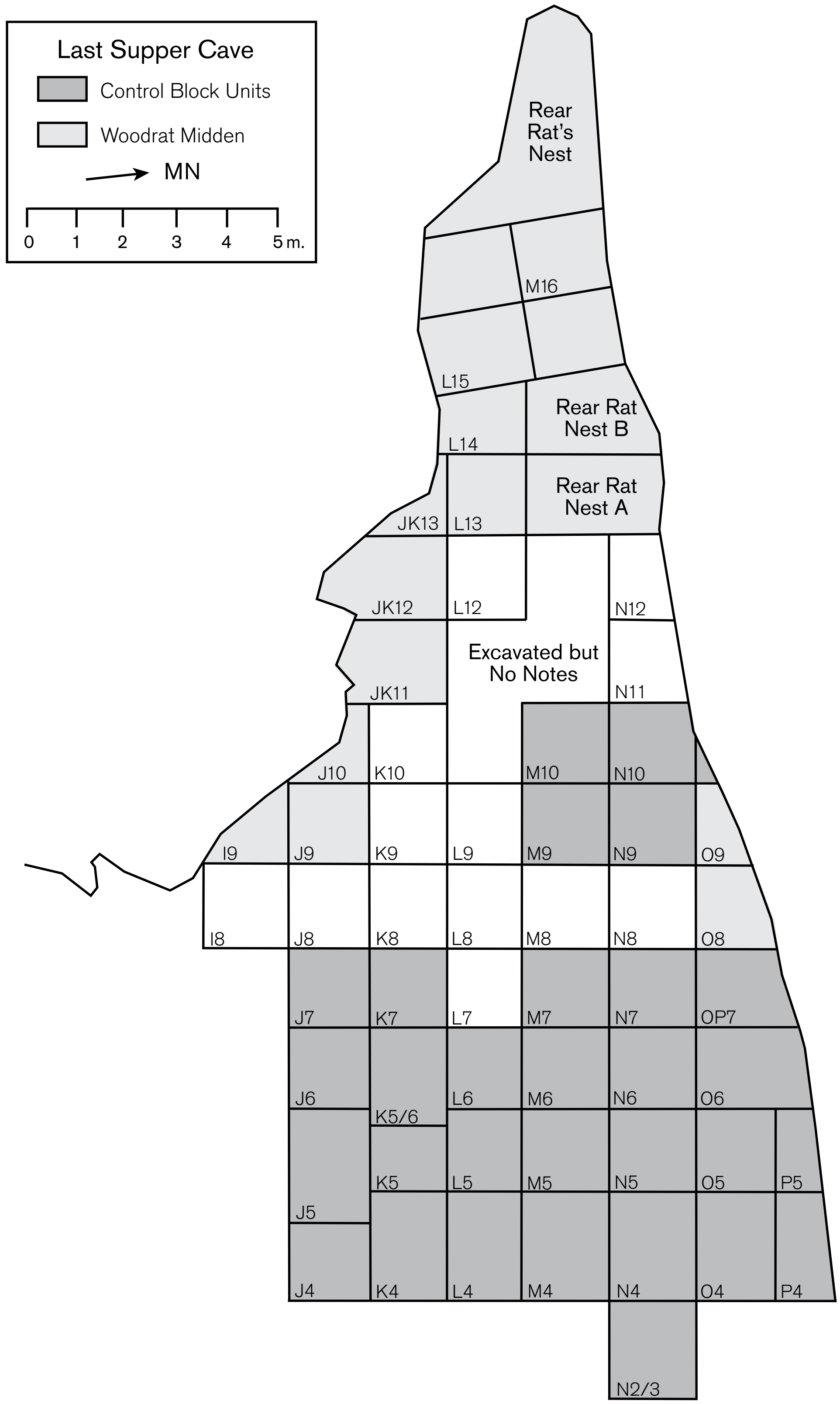


Figure 2. Planview of Last Supper Cave indicating areas of intense woodrat activity (light gray) and Layton and Davis' (1978) Control Block units (dark gray).

Table 1

THE RELATIONSHIP BETWEEN LAYTON'S MAJOR STRATIGRAPHIC FIELD DESIGNATIONS AND LAYTON AND DAVIS'S (1978) TIME-STRATIGRAPHIC STAGES (ADAPTED FROM GRAYSON 1988)

Major Field Stratigraphic Designations and Incorporated Field Stratigraphic Units			Correlation Between Layton's Field Designations and Time-Stratigraphic Stages		
Number	Major Field Designation	Incorporated Field Stratigraphic Units	Time-Stratigraphic Stage	Age	Layton's Major Field Designations
1	Surface	–	–	Historic	1 (Surface)
2	Ash	Ash Surface Ash Talus	5	6,000–0 B.P.	2 (Ash) and 3 (Organic)
3	Organic	Organic 1 Organic 2 House Fill Large Rocky Talus	4	7,000–6,000 B.P.	4 (Suborganic)
4	Suborganic	Suborganic 1 Suborganic 2	3	9,000–7,000 B.P.	5 (Upper Shell) and 6 (Lower Shell)
5	Upper Shell	Upper Shell Middle Shell Intermediate Shell Shell 1 Shell 2	2	Pleistocene	7 (White)
6	Lower Shell	Basal Shell Terminal Shell Shell 3 Shell 4 Rocky Shell	1	Miocene	8 (Pink)
7	White	White White Rocky			
8	Pink	Pink, Red			

white layer that likely resulted from calcium precipitates leaching from the cave roof and evaporating on the floor (Layton and Davis 1978). The earliest evidence for human occupation, including a number of Great Basin Stemmed projectile points, was found within this layer. Directly above the White Zone was the "Lower Shell Zone," which contained abundant artifacts and *Margaritifera* sp. (freshwater mussel) shells harvested from nearby Hell Creek. The four major stratigraphic units overlying the Lower Shell Zone (the "Upper Shell," "Suborganic," "Organic," and "Ash" zones) constituted the upper 30 in. (~76 cm.) of deposits and were horizontally and vertically variable throughout the cave. This variability likely resulted from differing conditions of moisture, temperature, depositional processes, heavy bioturbation, and cultural disturbance (Layton and Davis 1978).

Noting the stratigraphic complexity of the site's deposits, Layton brought the late geoarchaeologist Jonathan Davis to the site in 1974 to better characterize the stratigraphy and help assess the integrity of the deposits. Layton and Davis (1978) converted Layton's initial major field stratigraphic designations into a series of "time-stratigraphic stages" based in part on radiocarbon dates obtained following the completion of fieldwork (see Table 1 and Fig. 3). No dates were obtained from Stage 1 (Layton's Pink Zone), but the stratum was estimated by Davis to be of Miocene age. Stage 2 (Layton's White Zone) extended from the top of the pink clay loam to the top of the white sediment, permeated throughout with gypsum-charged precipitates. The present-day arid conditions of the cave and those throughout the Holocene were likely inadequate to

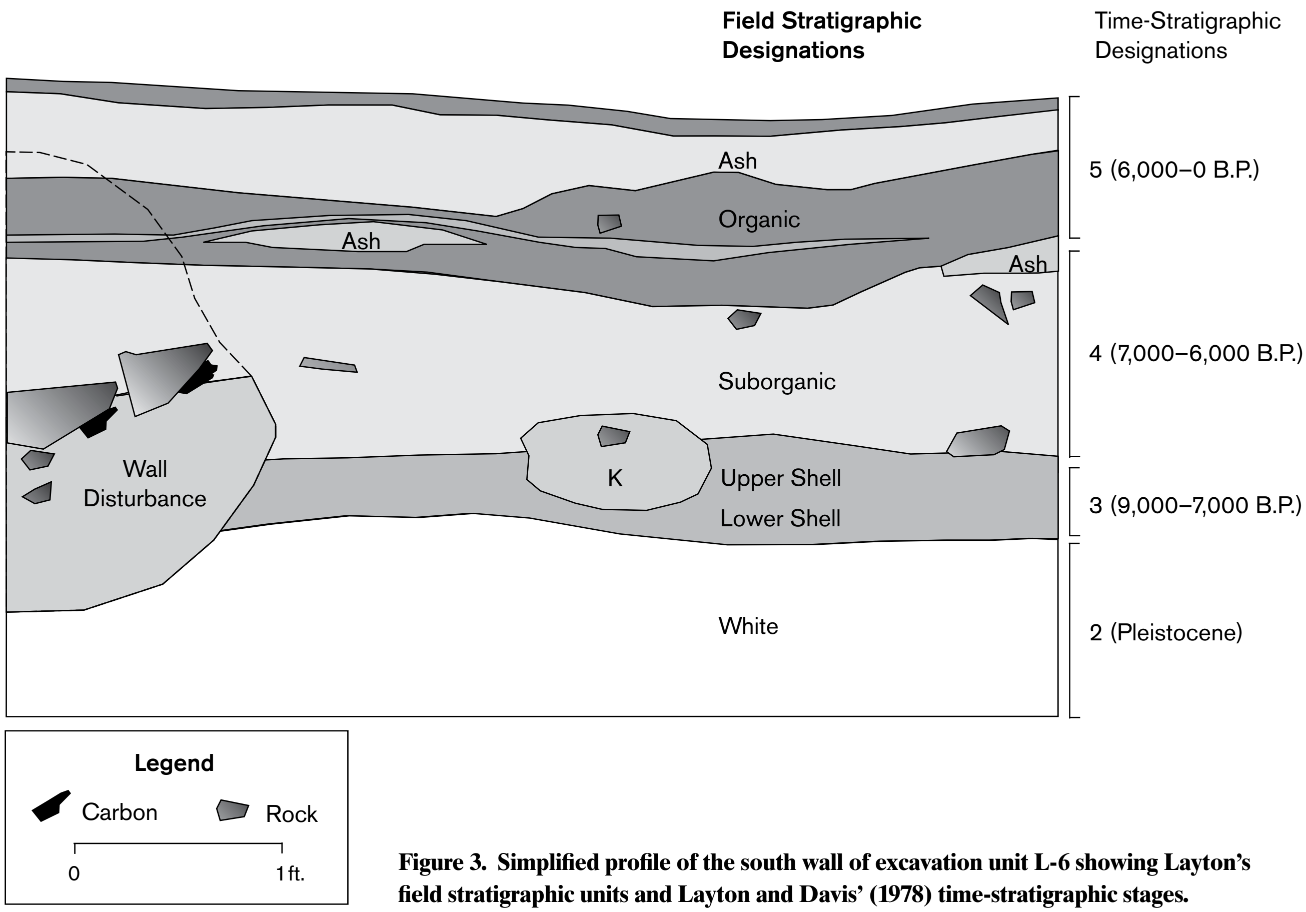


Figure 3. Simplified profile of the south wall of excavation unit L-6 showing Layton's field stratigraphic units and Layton and Davis' (1978) time-stratigraphic stages.

produce such a degree of chemical precipitation, so Davis interpreted this as an indication that considerably more mesic conditions were present when Stage 2 sediments were deposited (Layton and Davis 1978). Four radiocarbon dates, ranging in age from 8,960 ± 190 to 8,260 ± 90 B.P., that were obtained from charcoal and shell found above the White Stratum suggested to Layton and Davis (1978) that Stage 2 deposits predated ~9,000 B.P. and likely extended into the terminal Pleistocene. Stage 3 (Layton's Lower and Upper Shell zones) extended from the top of the White Zone to the bottom of Mazama tephra, deposited ~6,850 B.P (Bacon 1983). The overlying Mazama tephra and five radiocarbon dates obtained on charcoal and shell (6,905 ± 320, 8,260 ± 90, 8,630 ± 195, 8,790 ± 350, and 8,960 ± 190 B.P.) led Layton and Davis (1978) to suggest that Stage 3 spanned the period from ~9,000 to ~7,000 B.P. Stage 4 (Layton's Suborganic Zone) primarily consisted of the Mazama tephra deposits, and although no radiocarbon dates were obtained from the layer at that time, Layton and Davis (1978) estimated that Stage 4 spanned the period from ~7,000 to ~6,000 B.P. due to the presence of the tephra. Stage 5 (Layton's Organic and Ash zones) extended from the top of the Mazama tephra to the surface of the cave's deposits. Three radiocarbon dates from that level were obtained on charcoal and wood (1,043 ± 175, 1,490 ± 50, and 1,545 ± 360 B.P.), but the nature of the upper deposits was such that bioturbation and other disturbances precluded Layton and Davis from distinguishing these strata from one another throughout much of the cave. Therefore, Stage 5 was assigned a very coarse age range of ~6,000 to 0 B.P.

Part of Davis' work at LSC entailed assessing the stratigraphic integrity of the site. In doing so, Layton and Davis (1978) recognized that sections of the cave were heavily disturbed by both animal and human activity. Unstratified woodrat nests existed throughout much of the Stage 5 deposits, primarily near the rear and side walls of the cave (see Fig. 2). House posts and stone enclosures penetrated into the upper deposits as well, and likely contributed to the mixing of the upper strata (Layton and Davis 1978). Therefore, the potential for chronological control is likely minimal in some portions of the cave—particularly the far interior, walls, and upper strata. Despite this mixing, Layton and Davis (1978) suggested that sections of the cave retained a high degree of stratigraphic integrity, particularly the basal deposits in the center and mouth of the cave. They made the following observation:

> Two parts of the cave's cultural deposits were found to have a high degree of stratigraphic integrity. One is the top surface of the deposit with its rock enclosures and associated evidence of cattle rustling…. The other cultural deposits with stratigraphic integrity are at the very bottom of the site. They include a distinctive lithic assemblage radiocarbon dated from 9,000 to 8,000 B.P. [Layton and Davis 1978:4-3-4-4].

Layton and Davis (1978) referred to those deeper, purportedly-intact deposits as "the Control Block," involving 31 5-ft.^{2} (~1.5 m.^{2}) excavation units containing abundant cultural materials, including Great Basin Stemmed projectile points, bifaces and flake tools, debitage, and hearth features. They maintained that the lower levels of the Control Block held the potential to provide important information about early prehistoric human behavior. We evaluate that claim here.

MATERIALS AND METHODS: RADIOCARBON DATES AND TIME-SENSITIVE PROJECTILE POINTS FROM LAST SUPPER CAVE

We used two datasets to evaluate the stratigraphic integrity of LSC's deposits. First, we compiled all radiocarbon dates obtained on materials recovered from the site, including those originally reported by Layton and Davis (1978), Grayson (1988), Smith (2008), Grant (2008), Smith et al. (2013), and Taylor and Hudson (2012). Using unpublished field notes recorded daily by the site's excavators and generously made available by Tom Layton, we attempted to tie the locations of each sample to the excavation's grid system as well as situate them within the natural strata from which they were recovered. Second, using the excavators' notebooks, which contain detailed sketches of virtually every projectile point recovered *in situ* together with planview maps showing their respective locations, we compiled counts of all typable points recovered from LSC (Fig. 4).

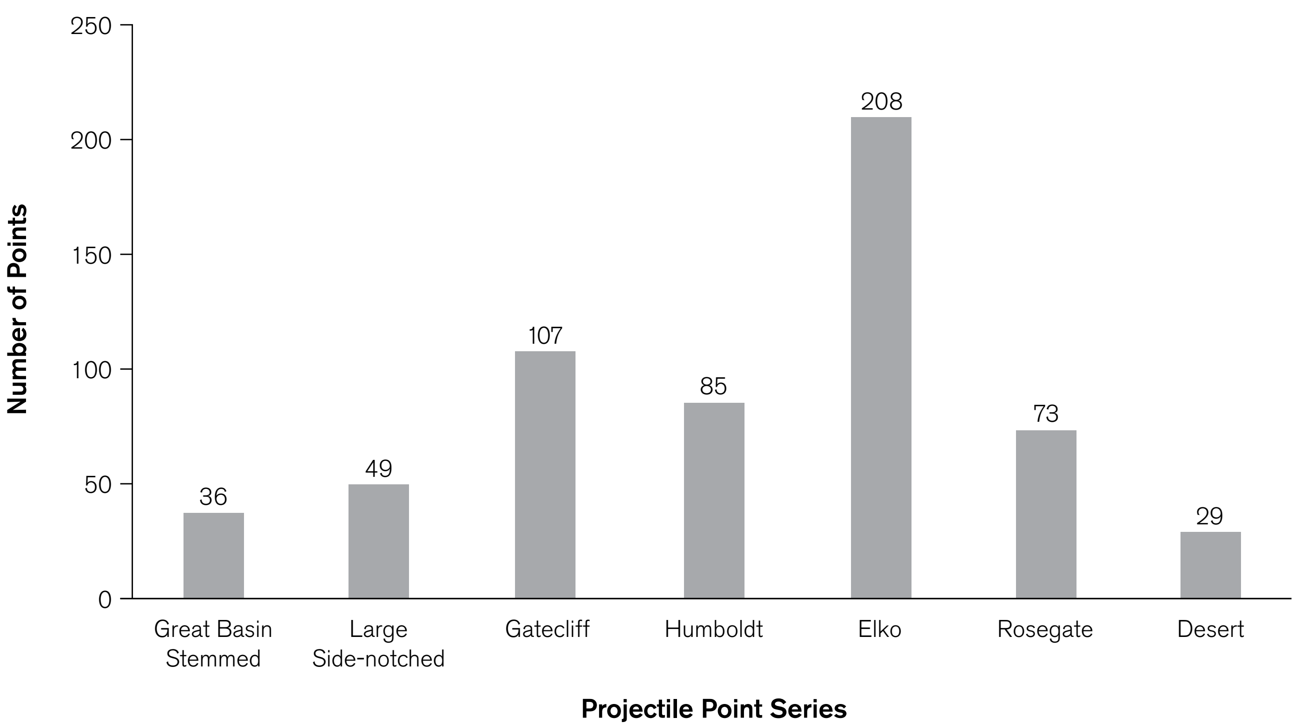


Figure 4. Frequencies of time-sensitive projectile points recovered in situ as well as from woodrat nests and excavator's screens.

For points recovered during the screening process, we were often still able to assign them to natural strata. We classified the LSC points using the morphological criteria outlined by Thomas (1981), but relied upon Hildebrandt and King's (2002) chronology—developed specifically for the California-Great Basin Interface adjacent to northwestern Nevada—when they were used as time markers to evaluate the integrity of the LSC strata.

RESULTS

Radiocarbon Dates

A comprehensive list of all radiocarbon dates obtained on materials from LSC and their respective locations, plotted on a planview map of the site, are displayed in Table 2 and Figure 5. Figure 6 shows the relationship of those dates to the strata assigned to Layton and Davis' (1978) time-stratigraphic stages. Several AMS radiocarbon dates obtained on hearth charcoal (Grant 2008; Smith 2008) generally support Layton and Davis' (1978) time-stratigraphic stages. Smith's (2008) single radiocarbon date of 10,280±40 B.P. from hearth charcoal in Stage 2 (Layton's White Zone) deposits confirms Layton and Davis' (1978) assertion that the stratum contained terminal Pleistocene age deposits. Furthermore, Layton and Davis' (1978) claim that Stage 3 deposits (Layton's Upper and Lower Shell zones) range from ~9,000 to 7,000 B.P. is supported by Grant's (2008) radiocarbon dates, obtained on hearth charcoal (8,160±50 and 8,910±50 B.P.). These samples fall within the range of Layton and Davis' (1978) earlier radiocarbon dates for Stage 3, which span from 8,960±190 to 6,905±320 B.P. It is noteworthy that two of Layton and Davis' dates, 8,960±190 and 8,260±90 B.P., were obtained on charcoal from the same hearth feature. These dates do not overlap when calibrated to two sigma, and both contain large errors, limiting their utility in refining estimates of the early occupations at LSC. Fortunately, Grant (2008) redated that feature (using the AMS technique) to 8,910±50 B.P., which we believe better represents the true age of the feature. Thus, together, the Stage 2 and Stage 3 deposits—which contained the site's Paleoindian assemblage (see below)—date firmly to the terminal Pleistocene and Early Holocene.

AMS radiocarbon dates for the upper strata (stages 4 and 5) do not correspond as closely to Layton and Davis' (1978) time-stratigraphic stages. Grant (2008) obtained a date of 2,580±40 B.P. from Stage 4 (Layton's Suborganic Zone) deposits, which Layton and Davis (1978) suggested spanned ~7,000 to 6,000 B.P., due to the presence of Mazama tephra. This suggests, as the original investigators observed, that the upper deposits were mixed to some degree. Finally, a single date of 2,520±40 B.P. from Stage 5 deposits (Layton's Organic and Ash zones) and 17 (mostly) AMS dates on cultural materials from within woodrat nests in the cave (e.g., coprolites, hafted points, and bighorn horn sheaths tossed to the rear of the cave [Grayson 1988]) are also included in Table 2. The 2,520 B.P. date falls within Layton and Davis' coarse age estimate of 6,000–0 B.P. for Stage 5 deposits. While the artifacts and coprolites recovered from woodrat nests cannot be effectively tied to particular strata, they can nevertheless contribute to our understanding of when LSC was occupied because they were directly dated—a topic that we discuss below.

The Vertical Distribution of Time-Sensitive Projectile Points

Figure 7 shows the frequencies of diagnostic projectile points from excavation units both inside (light gray) and outside (dark gray) of the Control Block, displayed according to both Layton's major field stratigraphic designations and Layton and Davis' (1978) time-stratigraphic stages. Excavation units outside of the Control Block contained variable projectile point types within each stratum. In particular, Elko, Gatecliff, Humboldt, Large Side-notched, and Great Basin Stemmed projectile points were all found within Stage 2 strata (estimated to be terminal Pleistocene in age) in units outside of the Control Block, reflecting a substantial mixing of those deposits. Conversely, Stage 2 deposits within Control Block units contained only twelve Great Basin Stemmed and two "Humboldt" points (we discuss these below), while Stage 3 deposits contained points ranging from Great Basin Stemmed to Elko types. The later/upper Stage 4 and Stage 5 deposits appear to have been more mixed in the Control Block than the earlier/lower Stage 2 and Stage 3 deposits and contained points ranging from Large Side-notched to Desert Series types. In short, the vertical distribution of time-sensitive points within strata inside and outside of the Control Block generally support Layton and Davis' (1978) assertion

Table 2

SUMMARY OF RADIOCARBON DATES FROM LAST SUPPER CAVE

Lab Number	Dated Material	^{14}C Date[a]	Dating Method	2σ Calibrated Range[b]	Excavation Unit	Layton's Field Straton	Davis' Time-Straigraphic Unit	Original Reference
LSU 73-120	*Margaritifera* shell	8,790±350	Conv.	9,310–11,166	O-8	Lower Shell	Initial 3	Layton and Davis (1978)
WSU-120	*Margaritifera* shell	8,630±195	Conv.	9,254–10,223	N-7	Lower Shell	Initial 3	Layton and Davis (1978)
Tx-2541[c]	*Artemisia* Charcoal	8,960±190	Conv.	9,549–10,513	K-5	Lower Shell	Initial 3	Layton and Davis (1978)
WSU-1706[c]	*Artemisia* Charcoal	8,260±90	Conv.	9,024–9,450	K-5	Lower Shell	Initial 3	Layton and Davis (1978)
LSU 73-247	Charcoal	6,905±320	Conv.	7,177–8,401	O-4	Lower Shell	Terminal 3	Layton and Davis (1978)
LSU 73-164	*Artemisia* bark	1,545±360	Conv.	785–2,331	N-7	Organic	5	Layton and Davis (1978)
LSU 73-268	Willow post	1,043±175	Conv.	680–1,288	N-9	Organic	5	Layton and Davis (1978)
TX-2857	Charcoal	1,490±50	Conv.	1,301–1,522	O-4	Organic	5	Layton and Davis (1978)
A-4255	*Ovis* horn sheath[d]	1,780±60	Conv.	1,560–1,861	Rear Rat's Nest	–	Tentatively 5	Grayson (1988)
A-4257	*Ovis* horn sheath[d]	1,120±60	Conv.	929–1,179	Rear Rat's Nest	–	Tentatively 5	Grayson (1988)
A-4254	*Ovis* horn sheath[d]	1,750±70	Conv.	1,527–1,863	Rear Rat's Nest	–	Tentatively 5	Grayson (1988)
A-4256	*Ovis* horn sheath[d]	270±50[e]	Conv.	0–479	Rear Rat's Nest	–	Tentatively 5	Grayson (1988)
Beta-231717	Hearth charcoal	10,280±40	AMS	11,827–12,374	K-5	White	2	Smith (2008)
Beta-248288	Sinew (Rosegate)	580±40	AMS	529–653	K-10	Rat Nest	Tentatively 5	Smith et al. (2013)
Beta-248292	Sinew (Elko CN)	1,820±40	AMS	1,625–1,865	Rear Rat's Nest	–	Tentatively 5	Smith et al. (2013)
Beta-248290	Sinew (Elko Eared)	1,850±40	AMS	1,700–1,882	Rear Rat's Nest	–	Tentatively 5	Smith et al. (2013)
Beta-248289	Sinew (Elko Eared)	1,900±40	AMS	1,728–1,927	J-8	Rat Nest	Tentatively 5	Smith et al. (2013)
Beta-248291	Sinew (Elko Eared)	2,480±40	AMS	2,379–2,724	J-7	Rat Nest	Tentatively 5	Smith et al. (2013)
Beta-248287	Sinew (Humboldt)	3,700±40	AMS	3,921–4,152	Rear Rat's Nest	–	Tentatively 5	Smith et al. (2013)
CAMS-157310	Human coprolite	115±30[e]	AMS	0–270	Rear Rat's Nest	–	Tentatively 5	Taylor and Hutson (2012)
Beta-310892	Human coprolite	620±30	AMS	550–659	Rear Rat's Nest	–	Tentatively 5	Taylor and Hutson (2012)
CAMS-157315	Human coprolite	885±25	AMS	732–906	Rear Rat's Nest	–	Tentatively 5	Taylor and Hutson (2012)
Beta-310894	Human coprolite	1,400±30	AMS	1,281–1,353	Rear Rat's Nest	–	Tentatively 5	Taylor and Hutson (2012)
CAMS-157313	Human coprolite	1,745±25	AMS	1,570–1,714	Rear Rat's Nest	–	Tentatively 5	Taylor and Hutson (2012)
Beta-310893	Human coprolite	1,790±30	AMS	1,620–1,817	Rear Rat's Nest	–	Tentatively 5	Taylor and Hutson (2012)
CAMS-157312	Human coprolite	1,805±25	AMS	1,629–1,820	Rear Rat's Nest	–	Tentatively 5	Taylor and Hutson (2012)
CAMS-157316	Human coprolite	1,895±30	AMS	1,735–1,898	Rear Rat's Nest	–	Tentatively 5	Taylor and Hutson (2012)
CAMS-157314	Human coprolite	1,855±30	AMS	1,717–1,868	Rear Rat's Nest	–	Tentatively 5	Taylor and Hutson (2012)
CAMS-157311	Human coprolite	1,900±30	AMS	1,737–1,922	Rear Rat's Nest	–	Tentatively 5	Taylor and Hutson (2012)
Unknown	Charcoal	2,520±40	AMS	2,470–2,747	M-5	Organic	5	Grant (2008)
Unknown	Charcoal	2,580±40	AMS	2,499–2,771	N-5	Suborganic	4	Grant (2008)
Unknown	Charcoal	8,160±50	AMS	9,007–9,262	P-4	Lower Shell	3	Grant (2008)
Unknown	Charcoal	8,910±50	AMS	9,795–10,204	K-5	Lower Shell	3	Grant (2008)

[a]All dates listed are based upon the Libby half-life (5,568 years).

[b]Dates calibrated using online Oxcal 4.2 program with the Intcal 13 curve.

[c]Tx-2541 and WSU-1706 are from one sample divided into two parts and sent to different laboratories. Grant (2008) subsequently redated carbon from the same sample using the AMS method and obtained a date of 8,910±50 ^{14}C B.P.

[d]Grayson (1988) suggested that given the weight of *Ovis* bones and woodrats' inability to transport heavy items, these were likely tossed into the rear of the cave by people. Although it is difficult to know for sure, we include these dates in our evaluation of the occupation history of the cave.

[e]When calibrated at 2σ, the date extends beyond the present.

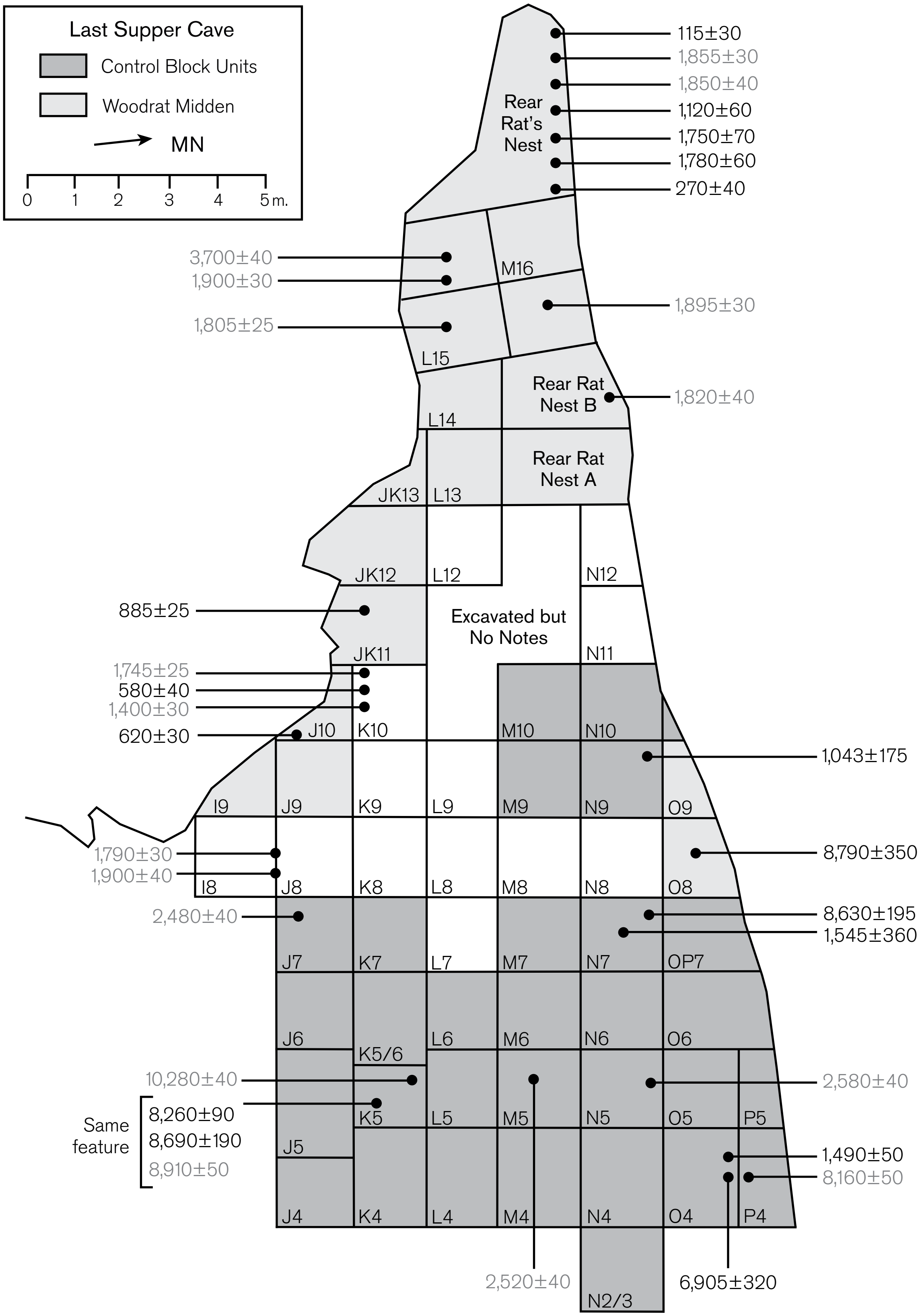
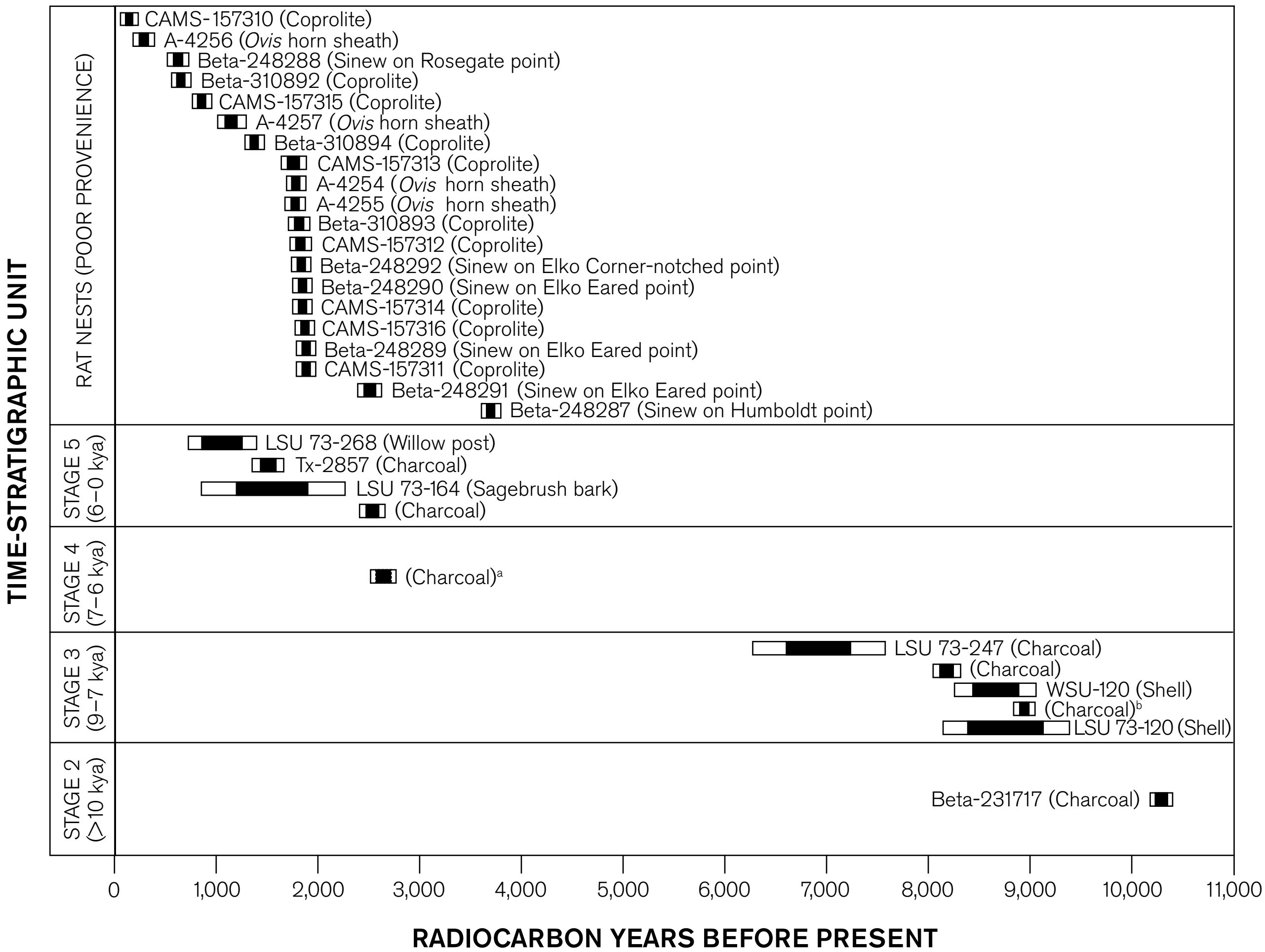


Figure 5. Planview showing locations of dated materials.
Note: black dates indicate conventional dates; gray dates indicate AMS dates.



[a]This date clearly does not correspond with Layton and Davis' (1978) age estimate for Stage 4 deposits (7,000–6,000 B.P.).

[b]This sample redated the same feature that also produced dates of 8,960±190 and 8,260±90 B.P. (Layton and Davis 1978), which are not shown here.

Figure 6. The distribution of radiocarbon dates from Last Supper Cave grouped by time-stratigraphic stage: black bars represent one Sigma ranges and white bars represent two Sigma ranges.

that the lower deposits within the Control Block units had the best potential for retaining a stratified record of human occupation at LSC.

DISCUSSION

Both radiocarbon dates and the vertical distribution of projectile points generally support Layton and Davis' (1978) assertion that stratigraphic mixing was a problem in parts of the LSC deposits. Projectile points ranging from Paleoindian to Late Archaic types co-occur in several strata—particularly Stage 2 deposits—within units outside of the Control Block. Similarly, upper strata within the Control Block units appear to have been mixed considerably, probably due to continuous woodrat burrowing/midden building and anthropogenic alteration (e.g., house/feature construction). However, Stage 2, lower Stage 3, and areas of upper Stage 3 deposits appear to have had considerably greater stratigraphic integrity. Radiocarbon dates from those intact strata range from ~10,300 to 7,000 B.P., indicating they are terminal Pleistocene to Middle Holocene in age.

The distribution of radiocarbon dates (see Fig. 6) suggests that LSC saw two relatively intense periods of human occupation: (1) ~9,250–8,250 B.P.; and (2) ~2,750–0 B.P. The paucity of Middle Holocene radiocarbon dates in Figure 6 could be interpreted as evidence that the site was not used during that period; however,

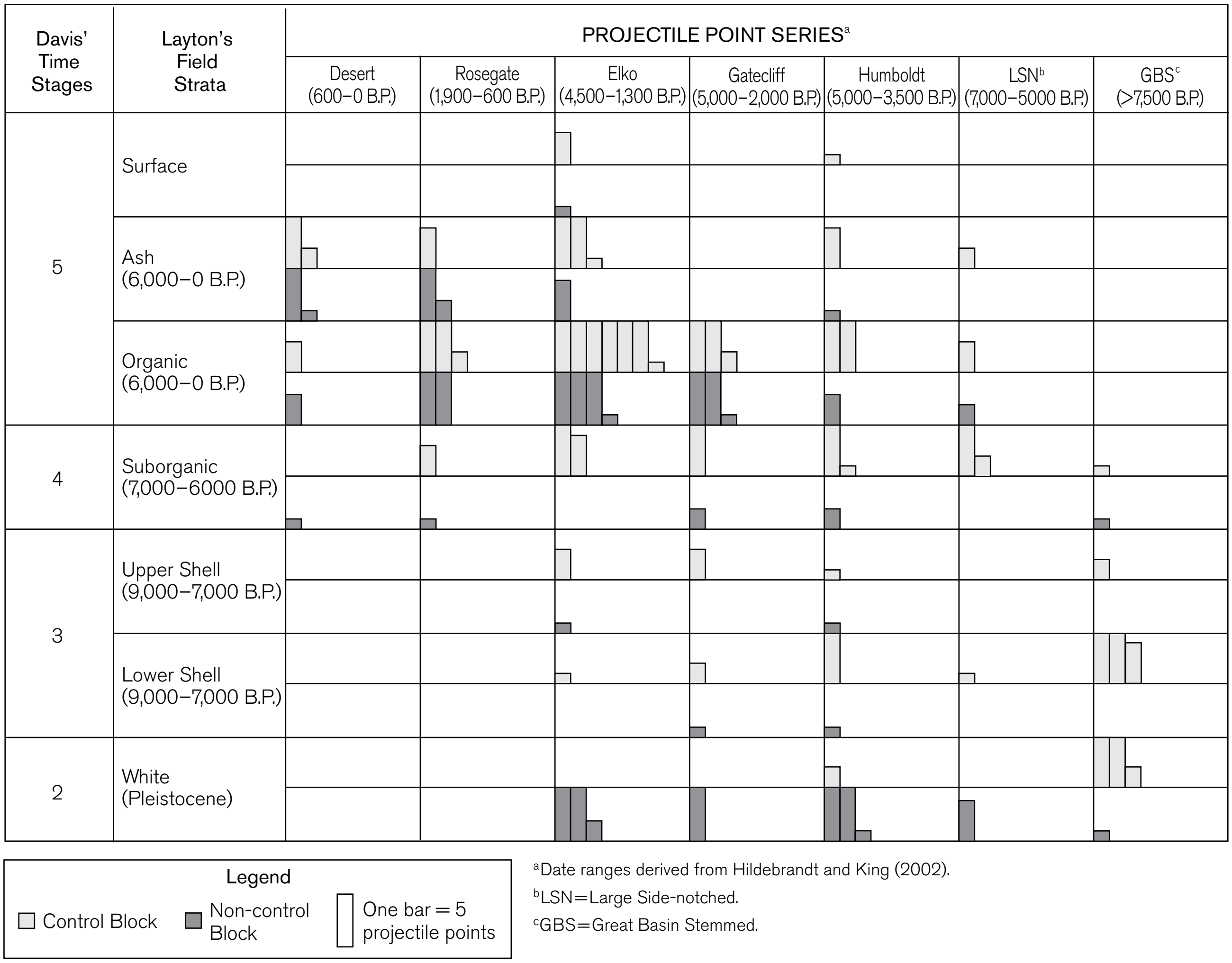


Figure 7. Distribution of time-sensitive projectile points within Control Block units (light gray) and non-Control Block units (dark gray).

we suspect that it is instead a function of inadequate efforts at dating in Middle Holocene-aged sediments (i.e., Layton's Suborganic Stratum). As Figure 4 shows, Large Side-notched points—Middle Holocene markers in the northwestern Great Basin (Hildebrandt and King 2002)—are well-represented. Therefore, our current working hypothesis is that the site was occupied at least intermittently throughout the entire Holocene. Future dating efforts will be directed at more thoroughly evaluating that hypothesis.

The fact that lower deposits within the Control Block appear to have been relatively intact is significant because a modest Great Basin Stemmed point assemblage was recovered from them (Fig. 8). Because LSC is located ~20 km. away and ~350 m. higher than the nearest pluvial lake basin, it represents a rare type of Paleoindian occupation in the Great Basin. The early assemblage, which consists of Great Basin Stemmed points, bifaces, unifaces, and waste flakes, has the potential to elucidate those technological activities that took place away from wetlands during the Pleistocene-Holocene transition. It is important to note that two concave base points, both of which we and Layton (1985) typed as Humboldt points according to the Monitor Valley Key, were also recovered from the White (i.e., Stage 2) Zone in Control Block units. Although poor time markers (Oetting 1994; Thomas 1981), most researchers (including us) agree that Humboldt points do not characterize Paleoindian occupations in the region. While Layton classified the concave base points as Humboldt, he noted that several of them could actually be Black Rock Concave Base (BRCB) points (Clewlow 1968),

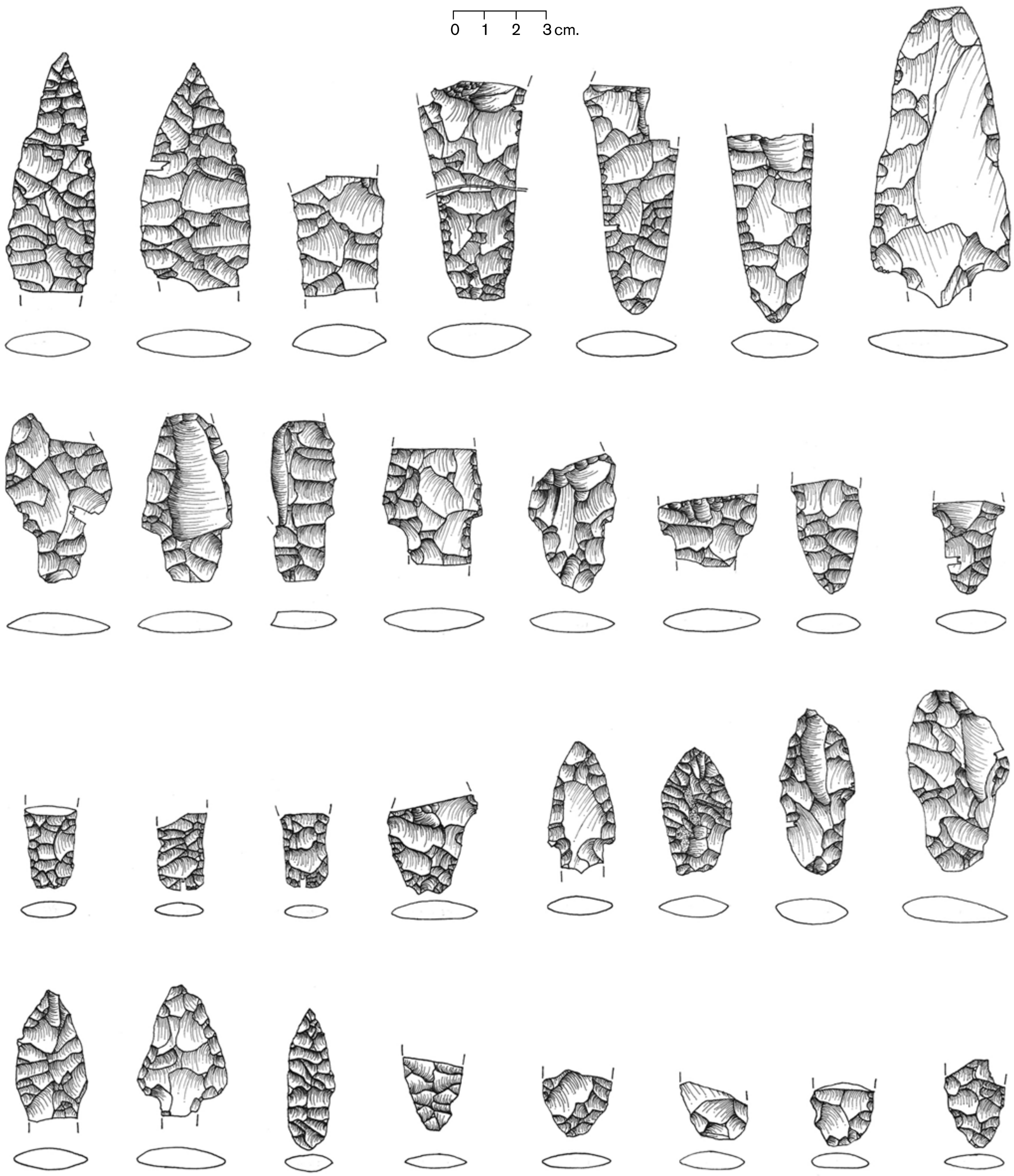


Figure 8. Select Great Basin Stemmed projectile points from Last Supper Cave.

which are commonly found with Great Basin Stemmed points. He based this interpretation on the fact that they are edge ground—an attribute more common among BRCB points than Humboldt points. If they are actually BRCB and not Humboldt points as we suspect, then their co-occurrence with Great Basin Stemmed points at

LSC is not surprising. More importantly, their presence in the White Zone within the Control Block units does not necessarily indicate that those deposits were mixed.

The upper deposits at LSC do not appear to have possessed good stratigraphic integrity either inside or outside of the Control Block. Grant's (2008) radiocarbon date of 2,580±40 B.P. from Stage 4 (Layton's Suborganic Zone, assumed to date from ~7,000–6,000 B.P.) suggests that the age ranges of the upper deposits need to be further refined. Stage 4 may either extend for a greater amount of time than originally believed, or significant bioturbation may have mixed the upper deposits where that sample was collected. Although we have yet to fully reconstruct the chronology of the upper deposits, radiocarbon dates obtained from Stage 5 sediments and woodrat nests located throughout the cave suggest that a pulse in occupation occurred ~between 2,750 and 0 B.P., with 11 dates obtained on coprolites, hafted projectile points, and *Ovis* horn sheaths clustered around ~1,800 B.P. Because these dates were obtained on different artifact types recovered from different parts of the cave, it is possible that LSC saw particularly heavy use around that time. A high frequency of Elko projectile points (n=208) (see Fig. 4), which were used in northwestern Nevada during that time (Hildebrandt and King 2002; Smith et al. 2013), suggests that this was the case. Given how mixed the upper deposits appear to have been, we are not optimistic about our potential for ever reconstructing human behavior at the site during the latter half of the Late Holocene beyond simply using projectile points and radiocarbon dates as proxies to estimate how intensely people occupied the site at that time.

CONCLUSIONS

In this paper we presented a synthesis of radiocarbon dates and data on the vertical distribution of time-sensitive projectile points in order to evaluate Layton and Davis' (1978) interpretation of the stratigraphic integrity of LSC's deposits. Our results indicate that they were largely correct. Radiocarbon dates from the lower deposits confirm their assertion of a Pleistocene age for Stage 2 deposits and ~9,000–7,000 B.P. for Stage 3 deposits. The general consistency of dates within those deposits, especially within Control Block units, suggests that lower strata were not substantially mixed. Upper strata appear to have been more mixed, as Layton and Davis (1978) suggested. Confidently establishing age ranges for Stage 4 and Stage 5 strata is not possible at this time, although further radiocarbon dating may identify sections that retained some integrity. Distributions of time-sensitive projectile points within the various strata similarly suggest that deposits outside of the Control Block and in the upper levels of the Control Block were fairly mixed.

Given the apparent integrity of the lowest deposits within the Control Block units, LSC has great potential to provide information about Paleoindian behavior and how it may have varied by site location. Because LSC is located far from the nearest pluvial lake basin, it represents a rare type of Paleoindian occupation in the Great Basin. Technological analysis of the early assemblage will help elucidate those activities that took place away from wetlands during the Pleistocene-Holocene transition. When combined with source provenance data that have already been obtained for early artifacts (Smith 2008, 2009), those technological data will allow us to better understand Paleoindian technological organization at an upland site. Such work is now underway, and we plan to compare the results of it with those provided by Smith (2006, 2007) for the nearby Parman Localities, four Paleoindian sites interpreted to represent early Holocene marshside camps that were occupied around the same time as LSC (also see Layton 1979). This comparison will improve our understanding of how, and potentially why, Paleoindians used different parts of the landscape in northwest Nevada.

ACKNOWLEDGEMENTS

Tom Layton (San Jose State University, retired) generously made the original field notes, photographs, maps, profiles, and projectile points available for study, and met our numerous requests to recall minute details about a project that occurred over 40 years ago with great patience. Without his support, this study would not have been possible. Don Grayson (University of Washington) provided additional details about his work with the LSC collection, Dave Rhode (Desert Research Institute) identified many of the charcoal samples included here, and Anan Raymond (U.S. Fish and Wildlife Service) and the Summit Lake Paiute Tribe approved our requests to directly date many of the samples included in Table 2. Funding was provided by the U.S. Fish and Wildlife Service, the Desert Research Institute, the Great Basin Paleoindian Research Unit, and the UNR Department of Anthropology. We appreciate the efforts of both the anonymous reviewers and the editorial staff, who made the final version of our paper stronger.

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