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Recent Archaeological and Geological Investigations at the Sunshine Locality, Long Valley, Nevada

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Archaeological testing at the Sunshine Locality, White Pine County, Nevada, was conducted to refine stratigraphic interpretations and to date deposits containing artifacts. Exposing a 5-m. vertical section, the testing produced nearly 6,000 lithic artifacts. The bulk of these artifacts is confined to the uppermost meter and rests in colluvial deposits, suggesting their redeposition. About 700 artifacts were recovered from alluvial sediments between 3.0 and 4.0 m. Radiocarbon dates of ca. 9,800 to 10,700 B.P., as well as other assemblage characteristics, are consistent with a Paleoindian/Early Archaic affiliation. Evidence of occupation appears to fall off after ca. 10,000 B.P., in concert with lower moisture conditions.

THE Sunshine Locality, located in southern Long Valley, Nevada (Fig. 1), has been investigated intermittently by archaeologists and geologists for three decades. Until the late 1980s, studies focused primarily on the extensive surface lithic scatters at the locality. Those scatters contained numerous Paleoindian artifacts, including fluted projectile points, and stemmed projectile points and crescents affiliated with the Western Stemmed Tradition (WST). Interest in the ages of occupation represented by these surface finds led to testing of the lithic scatters, but these excavations failed to reveal significant depth in the deposits. Since 1987, efforts have focused on examination of the deep alluvial section preserved in the channel adjacent to the surface scatters. In addition to exposing Late Pleistocene/Early Holocene deposits, geologic probes have strongly indicated the presence of a deeply buried cultural record.

Expanding on these stratigraphic studies, test excavations were undertaken in 1993. The purpose of this work was: (1) to refine stratigraphic descriptions and to obtain datable organic remains in order to better interpret the geologic history of the site; (2) to evaluate the deposits for the presence of a cultural record; and (3) to evaluate the processes responsible for the deposition of any recovered artifacts. This paper reports the authors' assessment of these issues and considers the occupational record of the Sunshine Locality in light of the environmental and cultural history of the region.

BACKGROUND OF THE SUNSHINE LOCALITY

Taking its name from nearby Sunshine Well, the Sunshine Locality (or Long Valley Locality [Tuohy 1988]) is located in southern Long Valley about 60 km. northwest of Ely, Nevada (Fig.

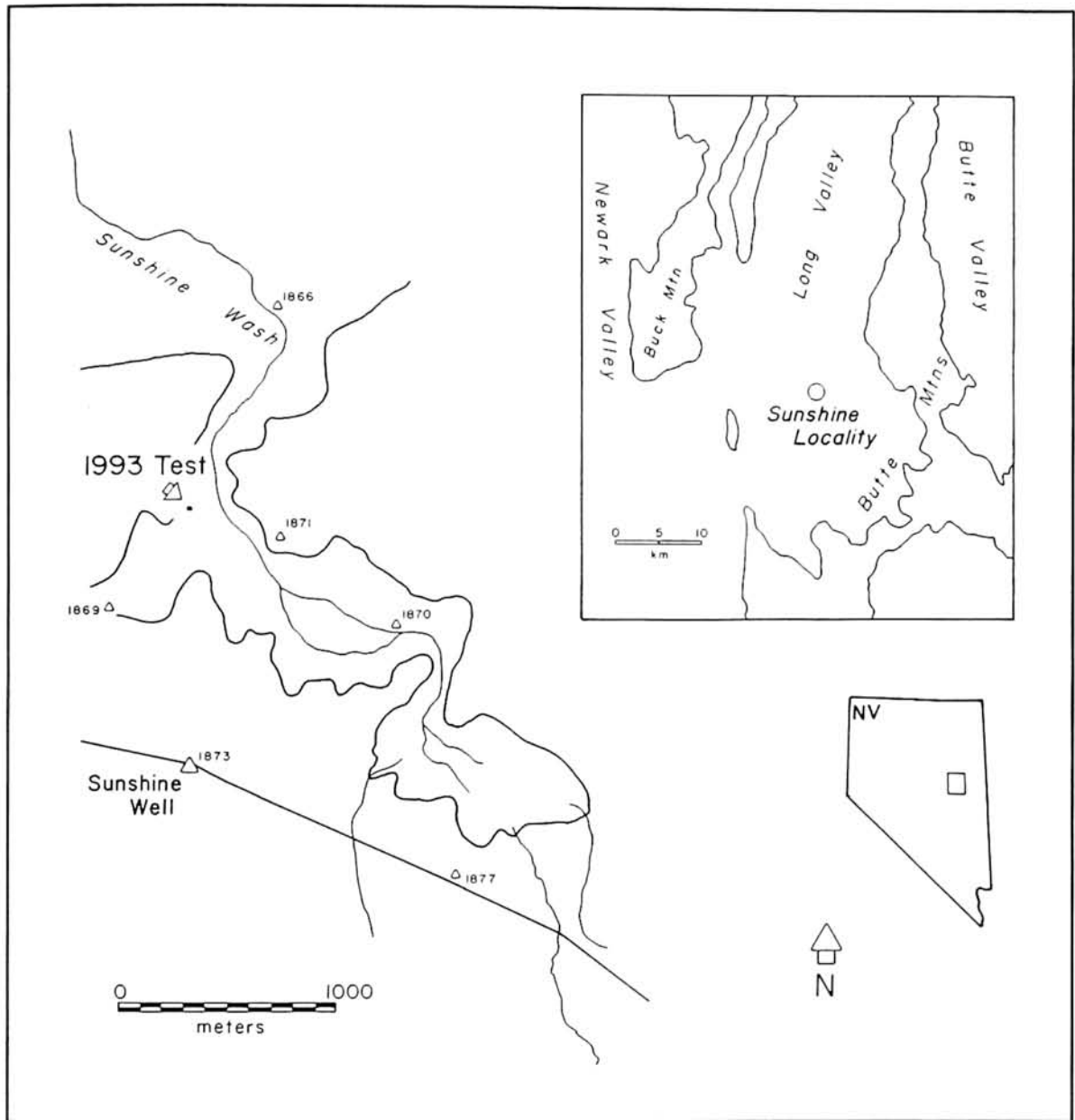


Fig. 1. Location of the Sunshine Locality.

1). As it contains a number of surface lithic scatters of Paleoindian and Early Archaic affiliation, the Sunshine Locality was placed on the National Register of Historic Places in 1978 (Price and Johnston 1988). The locality comprises a district of some 35,000 acres; the greatest concentration of sites borders a broad chan-

nel that lies to the east and north of Sunshine Well (Hutchinson 1988).

The channel (hereinafter referred to as Sunshine Wash), which is the dominant physiographic feature at the Sunshine Locality, forms east of the well, where several smaller channels join. As much as 500 m. wide, Sunshine Wash

extends for several kilometers in a generally northwestern direction before ending in distributaries on the floor of the valley south of the Long Valley playa. Sunshine Wash was formed by fluvial incision of lacustrine sediments as pluvial Lake Hubbs desiccated at the end of the Pleistocene. During this erosional phase, downcutting of seven meters or more took place. Subsequently, the channel filled with at least five meters of alluvial, colluvial, and eolian sediments; the modern floor of Sunshine Wash lies between one and four meters below the channel edges. The banks of the wash are formed by lacustrine sediments covered in most areas by a thin mantle of eolian sands and subjected to deflation in many areas.

At least seven lithic concentrations, usually associated with deflation surfaces, are present on the terraces and ridges bordering Sunshine Wash (Hutchinson 1988). The first reference to the archaeological record at the Sunshine Locality was made by Tadlock (1966) in his analysis of crescentic tools from the Great Basin.¹ Sustained study of the surface record, however, did not begin until 1972, when Gary Noyes and Philip Hutchinson began reconnaissance and mapping of the lithic scatters along Sunshine Wash. Noyes and Hutchinson identified seven clusters ("sites"), marking each with a permanent datum, all of which remain in place today. During a series of visits, they made sizable collections that were tied instrumentally to the datum in each cluster. By 1988, the collection, now housed at the Nevada State Museum, consisted of nearly 1,500 artifacts, including 540 projectile points and 130 crescents (Hutchinson 1988).

Early in their explorations, Noyes and Hutchinson contacted Donald Tuohy to report their discoveries. Encouraging them to continue their reconnaissance, Tuohy planned additional study of the locality under the auspices of the Nevada State Museum. Under the field direction of Robert York, test excavation and surface survey

began in 1973 (York 1974). York tested five locations coinciding with surface concentrations along the channel edge. These excavations failed to yield unequivocal evidence of undisturbed buried cultural deposits.

The latest phase of field research at the Sunshine Locality began in 1987 and combined the efforts of Desert Research Institute, Nevada State Museum, and the Bureau of Land Management (Tuohy and Hutchinson 1990). A program of stratigraphic testing was undertaken to determine geologic history and to evaluate the stratigraphic context of the surface archaeological sites. Backhoe trenches were excavated to expose stratigraphy in the channel bottom and along the margins of the channel. A detailed stratigraphic picture emerged from these studies (Nials and Davis 1990), along with several notable discoveries, such as deeply buried mammal (including *Camelops*), fish, and bird bone (Dansie 1990), other organic materials, and several small flake artifacts (Hicks 1990), all contained in alluvial deposits at significant depth. A radiocarbon date of $10,700 \pm 430$ RCYBP was obtained from alluvial sediments at a depth of about 2.75 m. below the channel surface.

In addition to stratigraphic testing, the team conducted a resistivity survey near one of the trenches. A resistivity anomaly was detected near the channel edge that suggested that a buried ridge of lacustrine sediment might be projecting from the west into the channel near the trench. To explore this possibility, augering was undertaken in 1992. Although these tests did not detect a ridge, artifacts were brought to the surface from an estimated depth of 2 m. The sediment apparently containing the artifacts was a distinctive stratigraphic horizon of dark organic sediment previously interpreted as paludal deposits and believed to date to ca. 8,500 B.P. The 1993 test excavations were performed, in part, to evaluate whether these deposits contained a primary archaeological record.

FIELD METHODS

Artifacts previously recovered in backhoe and auger testing were from unconsolidated sediments from depths of at least two meters. For reasons of safety, it was decided that testing should be done in a single large block rather than smaller units or trenches. This block, measuring 5 x 6 m., was tied to a grid that had been established for the auger testing the previous year. A permanent datum, with an elevation arbitrarily set at 10 m., was placed west of the block; the surface elevation at the block was slightly lower, ranging between 9.75 and 9.80 m. Vertical measurements hereinafter are reported as meters below datum (mbd) or as absolute elevations according to the site datum.

In the initial planning, consideration was given to mechanically stripping the upper beds to expose the deeply buried alluvial section. It was not certain, however, that artifacts were contained exclusively in these lower strata. Consequently, the entire vertical section was excavated in a uniform manner. Excavation began in a 1 x 6 m. trench (using 1 x 1 m. units) along the northern side of the block. The trench was advanced to a depth of about one meter before beginning excavation of the rest of the block, which was conducted in 2 x 2 m. units with horizontal control kept by the 1 x 1 m. units. Excavation of the trench continued ahead of the block in order to provide stratigraphic control for the rest of the excavation.

Vertical control was maintained in 10-cm. levels, in combination with the natural stratigraphy. Most sediments were skim-shoveled; consequently, *in situ* artifact recovery was rare. For the most part, all sediments were screened through 1/8-in. (3 mm.) mesh. In some levels where no artifacts were found, a 25% sample of the sediments was screened.

During five and a half weeks, approximately 100 cubic m. of sediment were removed and screened. The entire block was excavated to a depth of 7.6 m. (2.4 mbd), after which the exca-

vation surface was reduced to 4 x 4 m. by creating a 1-m. wide bench on three walls of the block. Excavation of the 4 x 4 m. block was completed to a depth of 6.0 m. (4.0 mbd). In the final phase, a 1 x 1 m. unit was excavated to 5.0 m. (5.0 mbd) in the southeastern corner of the excavation block. Thereafter, a soil auger was used to penetrate another 0.7 m. Testing to a combined depth of 4.3 m. (5.7 mbd) failed to reach the contact between the alluvial section and the underlying lacustrine deposits.

RESULTS OF THE EXCAVATIONS

Stratigraphy

Over the course of excavation, seven strata (A-G) were recognized (Fig. 2). Examination of stratigraphic profiles, along with sediment analysis, led us to combine several of these units, creating five analytical strata.

The base of the excavated block, from 4.3 m. to 7.3 m. (elevations correspond to the position of stratum boundaries in the vicinity of the column sample), comprises alternating lenses of alluvial sands and gravels. A distinction was made in the field between sandy units (Stratum F) and gravelly units (Stratum G). Although both formed under a fluvial depositional regime, and thus have been combined here for description, these textural classes were excavated and screened separately in the field.

Stratum F/G represents a braided stream channel. The westward migration of the channel is evidenced at the excavation block by cut-and-fill stratigraphy. Gravels are quite rounded and were probably derived from nearby beach sediments, which in turn are derived from limestone and volcanic rocks in the Butte Mountains; finer sediments, including subangular clay blocks, indicate periodic undercutting and collapse of nearby stream banks formed in lacustrine sediments. Such events may well be responsible for introducing artifacts into this stratum. From bottom to top, Stratum F/G displays a general reduction in grain size, indicating lower stream

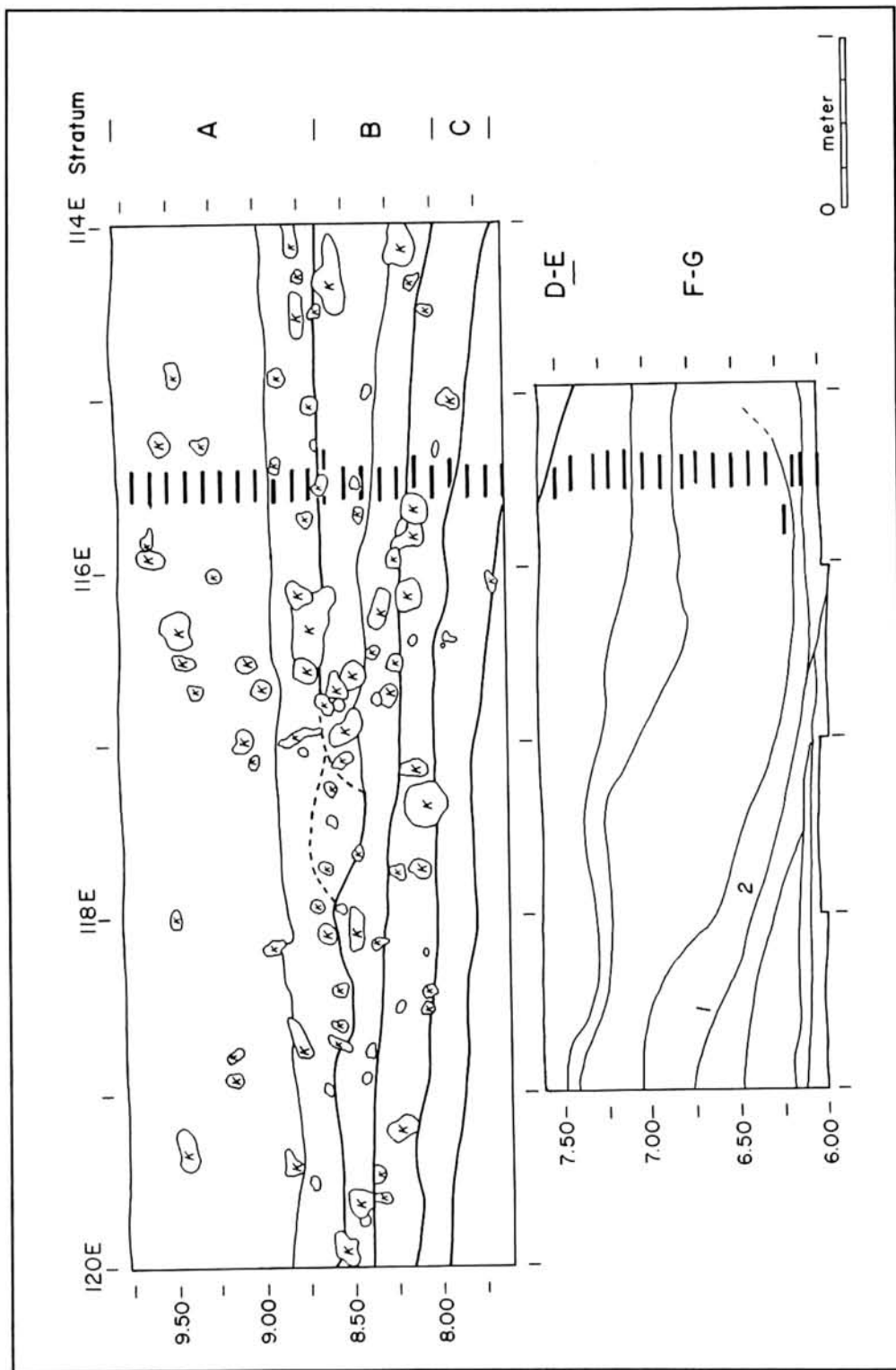


Fig. 2. Stratigraphic profile of the southern wall of the excavation block from the Sunshine Locality. The vertical strip of bars on the west side of the profile shows sediment sampling locations. The break at 7.6 m. is the position of the step. Units marked "K" indicate rodent burrows.

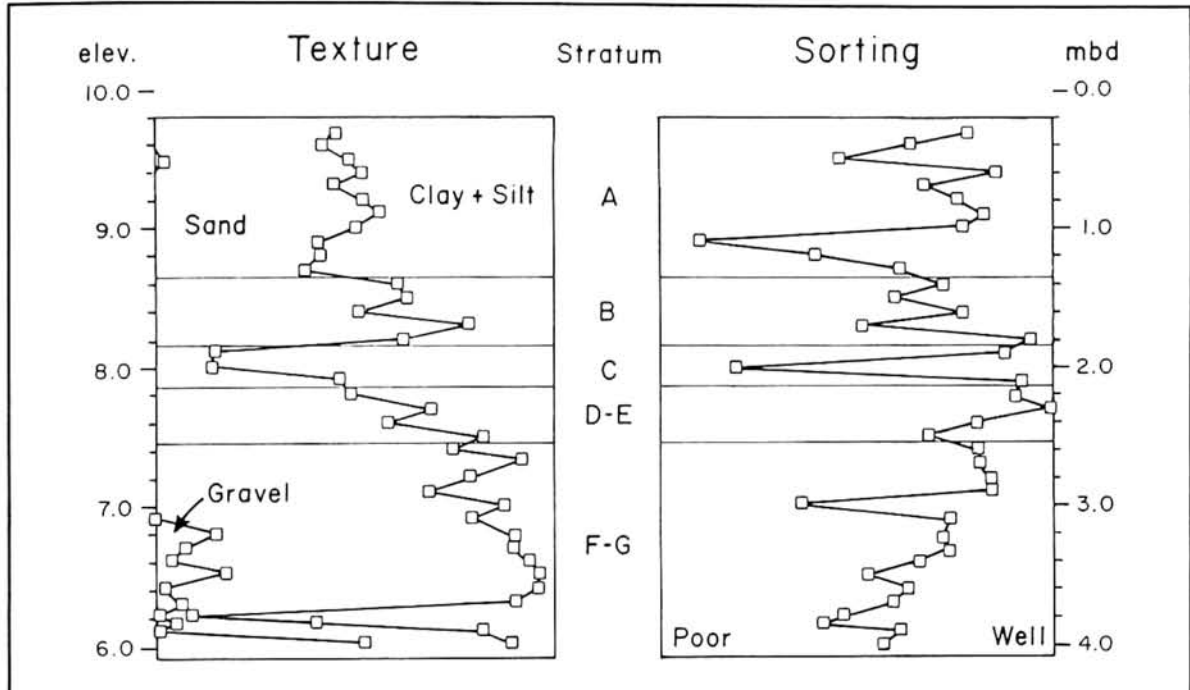


Fig. 3. Textural properties of the stratigraphic layers from the Sunshine Locality.

competency, probably relating to decreased precipitation over time (Fig. 3).

Strata E and D, which dip to the west and continue the fining textural trend of Stratum F, are well-sorted, fine sands. Although similar texturally (Fig. 3), Strata E and D were distinguished in the field on the basis of induration. The latter is more strongly cemented and displays platy textures, while both units exhibit oxidation and reducing colors. As the zone of cementation lies on a horizontal plane, rather than dipping westward, it clearly reflects pedogenic processes associated with the subsequent depositional unit, Stratum C.

Stratum C is roughly 0.25 m. thick and comprises very dark, well- to poorly sorted, sandy muds. With a significant eolian component, Stratum C appears to have formed under localized mesic conditions perhaps resulting from downstream blockage of Sunshine Wash by windblown sediments. This prominent stratigraphic marker, found widely in the channel bot-

tom, indicates that springs and seeps along the channel edges continued to produce sufficient discharge to support wet-meadow vegetation.

Reaching a maximum thickness of 0.7 m., Stratum B is a moderately well-sorted eolian unit, containing two massive beds. Extensive bioturbation is probably responsible for introducing artifacts from the stratum above. Near the base of Stratum B are two thin charcoal lenses that in parts of the block profile appear to lie directly over Stratum C. Elsewhere in the profile and in other sections of the wash, the ash couplet is separated from the darker sediments of Stratum C by several centimeters of light-colored, fine sand.

Stratum A consists of a meter or more of well- to poorly-sorted sands and muds (Fig. 3). While containing some eolian contribution, these sediments predominantly represent sheetflood re-deposition of lacustrine and eolian sediments derived from upstream sources and the adjacent channel margins. This unit contains a weakly

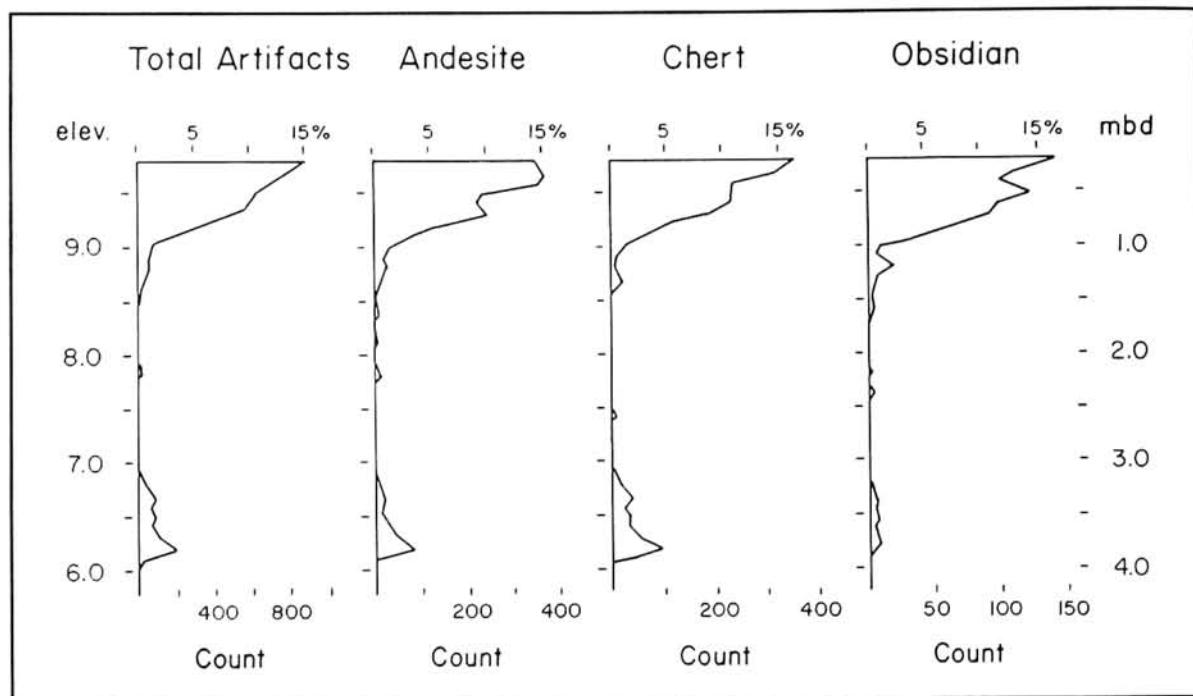


Fig. 4. Vertical distribution of artifacts from the Sunshine Locality. Proportional representation by 10-cm. level is calculated on the basis of the total count of artifacts and the count within each major material category.

developed soil probably related to a wetter interval, perhaps dating to the last three millennia. Stratum A is very bioturbated and contains abundant artifacts.

Artifact Descriptions

The block excavation yielded 5,872 artifacts (Table 1). Most of them are small, biface-thinning flakes, pressure flakes, or shatter; re-touched tools are rare. In all, 31 of 39 levels contained artifacts. The vertical distribution of artifacts is shown in Figure 4. Two assemblages dominate the collections and are evident in each material profile. The first was largely confined to Stratum A. Artifact density was highest at the surface, decreasing continuously to a depth of ca. 8.4 m. Those rare artifacts in Stratum B were likely the result of bioturbation, which was extensive in Strata A through C (Fig. 2). The second occurred in the lower part of Stratum

F/G, between Levels 31 and 38 (6.8 to 6.0 m.). The 1 x 1 m. probe in the corner of the block failed to produce any artifacts between Levels 39 and 49 (6.0 to 5.0 m.).

Artifacts in Stratum A and extending into Stratum B are believed to have been redeposited from the dense surface scatter that covers the ridge west of the excavation block and from other upchannel sources. This is consistent with the interpretation of these sediments as sheet-flood deposits. The precise source of these artifacts and the circumstances of their deposition are difficult to judge. In examining artifact frequencies along the primary axes of the excavations, a uniform decrease in artifact number from west to east is evident, that is, toward the center of the channel, in each level from the surface down to one meter. A similar, though less pronounced, pattern is evident along the upchannel to downchannel axis. There is, however, no

Table 1
DISTRIBUTION OF ARTIFACT TYPES BY STRATUM FROM THE SUNSHINE LOCALITY

Stratum	Artifact Class	Chert	Obsidian	Andesite	Welded Tuff	Other	Totals
A	biface	5	1	2	3	--	11
	uniface	2	--	--	--	--	2
	decortication flake	18	9	21	3	--	51
	interior flake/shatter	1,745	794	2,095	313	3	4,950
	core	--	--	--	--	--	--
	other ^a	28	2	13	--	--	43
						Stratum Subtotal	5,057
B	biface	--	--	1 ^b	--	--	1
	uniface	--	--	--	--	--	--
	decortication flake	--	--	--	1	--	1
	interior flake/shatter	18	6	27	8	--	59
	core	--	--	--	--	--	--
	other	--	--	--	--	--	--
						Stratum Subtotal	61
C	biface	--	--	--	--	--	--
	uniface	--	--	--	--	--	--
	decortication flake	--	--	--	--	--	--
	interior flake/shatter	5	8	22	2	--	37
	core	--	--	--	--	--	--
	other	--	--	--	--	--	--
						Stratum Subtotal	37
D/E	biface	--	--	--	--	--	--
	uniface	--	--	--	--	--	--
	decortication flake	--	--	--	--	--	--
	interior flake/shatter	6	1	4	5	--	16
	core	--	--	--	--	--	--
	other	--	--	--	--	--	--
						Stratum Subtotal	16
F/G	biface	3	1	3	--	--	7
	uniface	--	--	1	--	--	1
	decortication flake	17	2	27	9	--	55
	interior flake/shatter	271	34	233	85	1	624
	core	2	--	1	--	1	4
	other	4	1	5	--	--	10
						Stratum Subtotal	701

^a Includes irregularly shaped fragments.

^b Projectile point.

corresponding size gradation. These characteristics suggest that the majority of artifacts in Stratum A are derived from upslope sources, although it is not certain whether they were redeposited in sediment pulses or in an incremental fashion. In any event, since the proportions of different artifact classes are so similar from level to level, redeposition processes appear to have sampled the source artifact population on the ridge in a very similar manner throughout the period of deposition of Stratum A.

The Stratum F/G assemblage, or significant parts of it, probably also was redeposited. This conclusion is based on the fact that artifacts were retrieved in gravel lenses; no artifacts can be tied unambiguously to sand lenses. To further evaluate the possible effects of stream transport, a comparison was made between sediment textural properties and the frequency and size of artifacts from different lenses. Sediment samples from Levels 29 through 37 (6.94 to 6.14 m.) were extracted from the eastern wall of the block, while samples from Level 38 (6.1 to 6.0 m.) were collected from excavation (Brownholtz 1994). Some 362 artifacts were recovered in these sediment samples. The results of these comparisons indicate a general correlation between sediment texture and artifact size. Specifically, those samples containing large artifacts (surface area $> 5 \text{ cm.}^2$) were from lenses with the highest proportions of gravel-sized clasts; lenses with small gravel fractions contained only flakes of smaller size ($< 3 \text{ cm.}^2$).

The degree of edge abrasion on a subset of the artifacts from this sample was also assessed as evidence of stream transport. Using Shackley's (1974) criteria of stream transport damage, about 70% ($n = 22$) of the examined specimens at the Sunshine Locality were determined to be heavily or very heavily abraded. A second group of fresh or slightly abraded flakes constituted about 30% ($n = 9$) of the assemblage. None of the artifacts was undamaged (Brownholtz 1994).

These lines of evidence attest to the transport of artifacts or a high degree of reworking of the lenses containing artifacts. It must be noted, however, that the excavation techniques did not permit careful inspection of the precise locational relationships of artifacts and their matrix or the orientation of artifacts. It remains a distinct possibility that some of these artifacts were deposited on the surfaces of point bars or longitudinal bars, and were differentially affected by fluvial activity, with some artifacts remaining essentially *in situ*. This possibility was considered for several reasons. First, although their precise positions cannot be confirmed, most of the artifacts in Stratum F/G appeared to rest near the tops of gravel beds rather than being distributed throughout these beds. Second, microscopic examination revealed that about one-third of the artifacts exhibited no stream-related damage. Third, in several instances, the same gravel lens produced tightly associated flakes made of identical, rare lithic material. In such cases, it seems probable that these co-occurrences reflect *in situ* deposition and not fortuitous associations resulting from transport. As noted above, however, the nature of the field procedures precluded a full evaluation of these possibilities.

As mentioned earlier, artifacts do occur sporadically in other strata. Of note are several artifacts recovered from two surfaces that appear to represent primary depositional contexts. The older of these surfaces is marked in the stratigraphic profile as a thin organic stain that crosses through Stratum D/E. It descends from a maximum elevation of nearly 8.0 m. (2.0 mbd) along the eastern side of the block to about 7.3 m. (2.7 mbd) along the western side. This surface produced several small flakes. The second surface is one associated with the latest of two burn events that marks the initial period of deposition of Stratum B. The single projectile point recovered was associated with this surface (see discussion below).

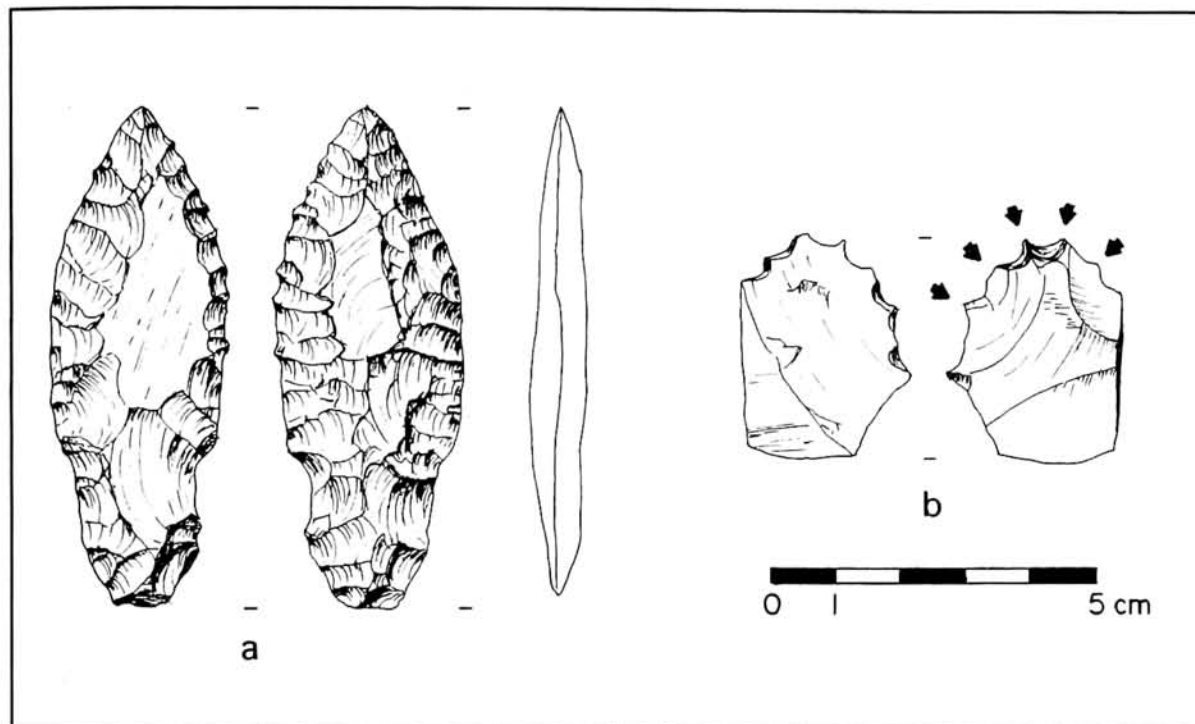


Fig. 5. Selected artifacts from the Sunshine Locality: (a) projectile point; (b) graver.

Flaked Stone Artifacts. Only a handful of artifacts were found *in situ*. One of these is the only projectile point found during the excavation (Fig. 5a). The point was discovered in eolian sediments of Stratum B, lying just above and separated by no more than one to two millimeters of sediment from the charcoal lens at the base of Stratum B. The stratigraphic relationship between the projectile point and the charcoal lens was evaluated carefully in the field, since the lens presented an opportunity for dating. The lens is more or less continuous across the entire profile, interrupted only occasionally by krotovinas. Judging from this continuity in the profile of the excavation block, the widespread distribution of the lens in other profiles, and its fragility, it seems likely that the lens was capped by windblown dust almost immediately after it was formed. The position of the projectile point did not disturb the charcoal lens, nor was it in close proximity to any obvious krotovi-

nas. For these reasons, it is believed that the AMS date on the charcoal couplet (see below) provides a very close age estimation for the deposition of the projectile point.

This complete projectile point, made of andesite, retains surfaces of the original flake blank from which it was made. It exhibits limited soft-hammer percussion in the stem-blade section and pressure flaking along its entire margin. The latter preparation extends roughly one centimeter onto the surface and gives the blade edge a slightly serrated plan. The stem is abraded along its edges, but adjacent flake arrises evidence no hafting abrasion. There is no wear or breakage associated with the distal end of the point and there is no indication of resharpening. Though apparently fully prepared, the point may never have been hafted.

The collection contains several other modified tools, including biface and uniface fragments. A multiple bitted graver (Fig. 5b) made from an

Table 2
 REPRESENTATION OF PLATFORM CHARACTERISTICS AMONG FLAKES
 IN THE SUNSHINE LOCALITY ARTIFACT COLLECTION

Stratum	Platform Type	Platform Angle		Totals
		Acute	Not Acute	
A	cortex	10	5	15
	single faceted	365	64	429
	multifaceted	724	47	771
F/G	cortex	2	4	6
	single faceted	71	27	98
	multifaceted	134	9	143

andesite flake was recovered from Level 34 (6.4 m.). There are five or six individual graver bits on this tool. They are separated by steep, concave fracture facets, which were perhaps made by pressing the flake against a stationary flaker. Hutchinson (1988) and Price and Johnston (1988), among others, have remarked on the prevalence of such tools in the Sunshine Locality collections. Multiple bitted graters are rare in other WST assemblages from this region, except at Smith Creek Cave, where there is a number of them in the Mount Moriah assemblage (Bryan 1979).

With these few exceptions, the bulk of the Sunshine Locality artifact sample represents lithic reduction debris, primarily resulting from late-stage biface percussion and pressure flaking, as seen clearly in the representation of platform types and statistics relating to artifact size. For example, in both the Stratum A and Stratum F/G assemblages, flakes that combine multifaceted platforms and acute platform angles are dominant, representing 60% and 54%, respectively, of all flakes with attached platforms (Table 2). When these are combined with flakes having acute, single-faceted platforms, occurrences rise to 90% and 83%, respectively, illustrating the significant contribution of biface-thinning reduction to the overall artifact collection. Such features as platform "lipping" and dorsal scar frequency exhibit complementary patterns.

Early stage reduction products, by contrast, are rare. Artifacts exhibiting cortex comprise a small fraction (ca. 2.5%) of the entire collection; decortication flakes, along with flakes with cortex platforms, represent less than 4% of the sample of flakes with platforms. Among all flakes with attached platforms, those in the smallest size categories dominate. For instance, flakes with surface areas of less than 1.0 cm.² represent 83% of this sample, and of these, more than two-thirds have surface areas of less than 0.5 cm.² Viewed together, these data illustrate the strong influence of pressure flaking in these collections.

Toolstone Representation. When considered in its entirety, the collection is dominated by andesite and chert artifacts, which nearly mirror one another in their vertical distribution. Obsidian and welded tuff specimens comprise minor but significant constituents, with obsidian somewhat less well represented in the lowest levels of Stratum F/G (Table 2). Analysis of the geologic source of these toolstones has not been undertaken; however, based on visual matches, it has been determined that a sizable proportion of the chert component comes from quarries at the southern end of Alligator Ridge, some 12 km. northwest of the Sunshine Locality. In addition to chert sources, these hills also contain cobbles of a low silica andesite that was used prehistorically. It is reasonable to suppose that a signifi-

cant part of the andesite component comes from that area; however, artifacts made from glassier andesites also are represented. A smaller component of the chert assemblage is of Long Valley jade, the source of which lies about 10 km. to the southwest. Additional chert types, encountered in other assemblages in the region but as yet unidentified as to source, are also represented.

The variety of geochemical types of obsidian in Late Pleistocene/Early Holocene assemblages in this region is substantial (Beck and Jones 1990a, 1990b, 1992, 1994; Jones and Beck 1990). Fully 30 or more chemical types have been identified, a situation attributable to the paucity of tool-quality obsidian sources in the local area and to the great mobility of Western Stemmed Tradition populations (Beck and Jones 1990b; Beck et al. 1992). These studies suggest that the early populations of this area ranged over hundreds of kilometers, utilizing obsidian sources as much as 250 km. to the north and south. The most prevalent and visually distinctive source represented in the surrounding valleys is Browns Bench, located 250 km. to the north in northeastern Nevada and southeastern Idaho. Based on visual characteristics, Browns Bench obsidian is well represented in the Sunshine Locality assemblage. A second visually distinctive glass, with an unblemished gray to green iridescent color, quite possibly represents the Double H Mountain source in north-central Nevada. This obsidian is not represented in the assemblages from adjacent valleys; its presence at the Sunshine Locality suggests a northwestern aspect to obsidian conveyance that has not been encountered in previous studies.

Radiocarbon Dating

Four radiocarbon dates were obtained from charcoal samples (Table 3). Two statistically identical AMS dates of ca. 10,250 RCYBP come from samples taken from a medium sand in Stratum F/G. Although from different elevations,

the samples come from a single lens that is draped over a cut bank. Each date is on a thumbnail-sized piece of charcoal. These fragments exhibited little rounding and retained obvious ring structure, suggesting they were not carried far from their source before deposition.

Samples of the charcoal lenses at the base of Stratum B were also obtained. Both samples come from a location where a stemmed projectile point was recovered. One sample, a bulk sediment sample assayed by conventional methods, yielded an age of $8,560 \pm 100$ RCYBP. The other, a collection of charcoal pieces, produced an AMS age of $9,800 \pm 60$ RCYBP. Of the two dates, the latter is less susceptible to contamination and is regarded as the better of the two dates.

CONCLUSIONS

The Sunshine Locality became available for human occupation following the retreat of pluvial Lake Hubbs from its late glacial highstand. As waters receded into the center of Long Valley from beach ridges that deeply etch alluvial fans south of the locality, streams began to incise channels in the lacustrine beds left by the lake. A number of streams draining the extensive watershed of the southeastern section of the valley joined east of Sunshine Well, where they incised a broad, deep channel. These events are undated, but considered in light of the regional paleoenvironmental record, they most likely took place between 15,000 and 11,000 B.P.

During this interval, Lake Franklin in the Ruby Valley, just north of Long Valley, appears to have dried completely (Thompson 1992). Rebirth of a shallow Lake Hubbs with an attendant rise in base level is suggested by a shift from an erosional to a depositional regime in Sunshine Wash. Dates from channel alluvium indicate that this episode lasted for at least 500 years, between 10,700 and 10,250 B.P., and perhaps longer. This episode probably coincided with a deep water phase in Lake Franklin (Thompson

Table 3
RADIOCARBON DATES FROM THE SUNSHINE LOCALITY

Sample No.	Depth	Stratum	Radiocarbon Age	¹³ C-Adjusted Age	Lab No.
1 ^a	6.69 m.	F/G	10,240 ± 80	10,240 ± 80	Beta-69779, CAMS-11232
1 ^a	6.43 m.	F/G	10,250 ± 60	10,240 ± 80	Beta-69780, CAMS-11233
2 ^b	8.05 m.	B	8,560 ± 100	—	Beta-69781
2 ^a	8.07 m.	B	9,820 ± 60	9,800 ± 60	Beta-69782, CAMS-11022

^a AMS assay on charred material.

^b Conventional technique on organic sediment.

1992) and may correspond to the Lake Gilbert event.

On the basis of data at hand, we cannot rule out occupation of the Sunshine Locality prior to 11,000 B.P.; however, it stands to reason that if fluted points are assumed to document the earliest component, occupation probably did not take place much before this time. Although direct dates on fluted points are virtually unknown in the Great Basin,² some researchers believe they predate stemmed point components by a few centuries (e.g., Willig and Aikens 1988; Grayson 1993; but see Bryan 1980, 1988). If it is contemporaneous with fluted point occupations in the Southwest and the Plains, the Sunshine Locality fluted point component would date to a narrow interval from 11,200 to 10,900 B.P. (Haynes 1992). In much of the western U. S., this period is interpreted as an episode of drought (Haynes 1991). Although the presence of a so-called Clovis drought remains to be confirmed in the Great Basin (but see Willig 1988), such a climatic event might help to explain the prevalence of fluted points at the Sunshine Locality and their paucity elsewhere in the region where hydrologic conditions were less conducive to subsistence pursuits.

It seems quite clear, however, that conditions for occupation were optimal for at least a millennium subsequent to ca. 10,900 B.P., and that this was an episode of significant human use of the Sunshine Locality. Indeed, the region as a whole witnessed increasing human use, al-

though no other site thus far discovered suggests more intensive, more repeated habitation than the Sunshine Locality. Numerous small lithic assemblages of this age are known from the area (e.g., Price and Johnston 1988; Zancanella 1988; Beck and Jones 1990a), but surveys of Long Valley and adjacent valleys have identified only one other location that remotely compares with the Sunshine Locality in terms of the geographic scale of its record. This is the Black Point site complex reported by Price and Johnston (1988). Although Black Point is very poorly known archaeologically, it resembles the Sunshine Locality in the fact that this extensive lithic scatter parallels a channel in a constricted section of Little Smoky Valley. Both the Sunshine Locality and Black Point may have been rich riparian habitats which served as occupational bases from which foragers made economic forays into adjacent valleys and uplands.

The period before 10,000 B.P. was a more moist climatic interval. The alluvial evidence at the Sunshine Locality suggests, however, that precipitation lessened and groundwater levels lowered in the valley through time. With these changing conditions, the stream at the Sunshine Locality grew less competent. It still managed to cut new channels and, as it migrated westward near the excavation block, the stream undercut its bank, releasing blocks of silt and clay into the stream. Such events appear to have introduced artifacts from living surfaces near the stream into the channel.

Sometime shortly after 10,250 B.P., with stream flow curtailed, eolian deposits began to choke the channel. Nevertheless, the water table remained high, and for perhaps several centuries the bottom of the channel held a well-vegetated marsh. With springs and seeps still active, Sunshine Wash continued to be visited, though apparently not with the same frequency or intensity as during the previous millennium. These conditions ended by ca. 9,800 B.P., conveniently marked by two fire events. The last evidence of occupation from our excavations dates from this time. Thereafter, windblown dust settled in the channel and after some period of time, perhaps millennia, sheet flooding following heavy storms flushed sediments into the channel.

The sequence of environmental events we propose does not fit neatly with paleoenvironmental reconstructions elsewhere in this region. Specifically, Thompson (1992) reported that more mesic conditions than those at present persisted until ca. 8,500 B.P. He based this conclusion on a marked shift in pollen frequencies indicating expansion of a shadscale association and upslope retreat of woodland at this time (Thompson 1992:11). Despite drying after 8,500 B.P., the Ruby Marshes maintained deeper-than-modern water levels until just after 7,000 B.P.

Considered in light of Thompson's (1992) conclusions, the Sunshine Locality record invites two interpretations. The simpler one is that the $9,800 \pm 60$ RCYBP date from the base of Stratum B is incorrect. If the $8,560 \pm 100$ RCYBP date instead is correct, there would be no inconsistencies between paleoenvironmental records. Clearly, additional samples for dating must be collected, although for the moment we favor the earlier date because there is less of a chance that it is contaminated.

The second interpretation is that the Sunshine Locality and southern Long Valley began to show the effects of postglacial xerification long before other hydrologic systems such as the

Ruby Marshes. This argument makes sense in light of the relatively smaller hydrographic basin supplying Sunshine Wash with water and the lower elevations of the surrounding Butte Mountains, which would not intercept as much precipitation as higher ranges such as the Ruby Mountains adjacent to the Ruby Marshes. If accurately reconstructed, these conditions would not only characterize Long Valley but many other poorly watered valleys in this region and likely would have implications for the records of human settlement in them as well.

Human use of the Sunshine Locality did not end with the Western Stemmed Tradition occupation, although there may have been long intervals when the area was not visited. The surface record contains a substantial Pinto component, as well as Elko, Humboldt, and Gatecliff series projectile points. At present, we cannot assess the chronology or magnitude of these occupations. Suffice it to say that the Sunshine Locality was an attractive stopping point, albeit at irregular intervals, during the Early and Middle Holocene, when the archaeological record of adjacent valleys suggests a significant diminution of use (Beck and Jones 1990a, 1994; Jones and Beck 1990) and, following the Middle Holocene, the barest hint of the development of an upland subsistence orientation. Discovery of a stratified record of these later phases of occupation, however, awaits further studies at the Sunshine Locality.

NOTES

1. The Long Valley crescents reported by Tadlock (1966) were from a private collection made on the Long Valley playa to the north of the Sunshine Locality, rather than from the locality itself (Hutchinson 1988; Tuohy 1988).
2. There is one case in which a fluted point has been directly dated in the Great Basin. A fluted point was recovered together with two Lake Mojave points at the Henwood Site in the Mojave Desert (Warren and Phagan 1988). Two radiocarbon dates ($8,470 \pm 370$ RCYBP and $4,360 \pm 280$ RCYBP) were obtained on the level from which these points were

collected (Douglas et al. 1988; Warren and Phagan 1988). The latter of these two dates has been discounted by Douglas et al. (1988) because it is out of line with the other dates from the site. The former date, however, is also out of line with radiocarbon dates obtained for fluted point components at sites in the Southwest and the Plains (see Haynes 1992). Thus, more dates are needed before the question of fluted point chronology in the Great Basin can be addressed effectively.

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