Report of 2009 Archaeological Field Research at BEN-192, the Fluted-Point Locality near Serpentine Hot Springs, Bering Land Bridge National Preserve, Alaska

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Introduction

This report presents results of archaeological field research carried out during 2009 at BEN-192, the fluted-point locality near Serpentine Hot Springs, by archaeologists from the Center for the Study of the First Americans, Texas A&M University. BEN-192 is located 2 km north of the hot springs, along a tributary of Hot Springs Creek, at latitude 65º52' North and longitude 164º43' East (Figure 1). R. Gal, C. Young, and S. Gilbert-Young discovered and preliminarily investigated BEN-192 in 2005 (Young and Gilbert-Young 2007). They found the base of a fluted point on the surface of the ground, prompting test excavations to determine whether artifacts occurred in a buried context. They excavated two 50-cm^2 test pits near the fluted point's find-spot, unearthing flakes associated with charcoal flecks (Young and Gilbert-Young 2007). Samples of this charcoal yielded dates of 9480 ± 40, 10,250 ± 60, 10,060 ± 40, and 10,250 ± 60 radiocarbon years ago (^{14}C BP), from depths of 30-32, 36, 37, and 39 cm below the surface, respectively (Young and Gilbert-Young 2007). If these dates can be shown to be directly associated with fluted points at BEN-192, then they would indicate an age for these artifacts of about 12,200-12,000 calendar years ago (cal BP).

We revisited Serpentine Hot Springs to evaluate the context of the fluted-point assemblage and research potential of the site. Two agencies provided financial support for the project: the Shared Beringia Heritage Program of the U.S. National Park Service and the First Americans Professoship of the Center for the Study of the First Americans, Texas A&M University. Our fieldwork occurred between July 26 and August 9, 2009, and the research team included Ted Goebel (project director), Michael Waters (geoarchaeologist), Sergei Slobodin (Russian representative), and Kelly Graf (field supervisor), as well as Texas A&M University graduate students John Blong (who supervised the small block excavation) and Josh Keene, and student representative Aluki Brower from Bering Straits Native Corporation. Robert Gal also participated in the fieldwork. Our activities focused on three tasks: (1) collecting data for a detailed topographic map of the site, (2) surface survey and surface artifact collection, and (3) excavation of an area totaling about 11 m^2. M. Waters also conducted preliminary geomorphic studies of the site, and R. Gal conducted a surface survey of nearby BEN-170, where we collected a small assemblage of lithic artifacts.

Subsequent to completion of the field work, during the 2009-2010 academic year we cataloged and analyzed all lithic artifacts and bones recovered from BEN-192 and BEN-170, and we submitted research proposals to two funding agencies--the National Science Foundation and National Geographic Society--to support the next phase of field work planned at BEN-192. This report summarizes the field and laboratory activities completed to date.

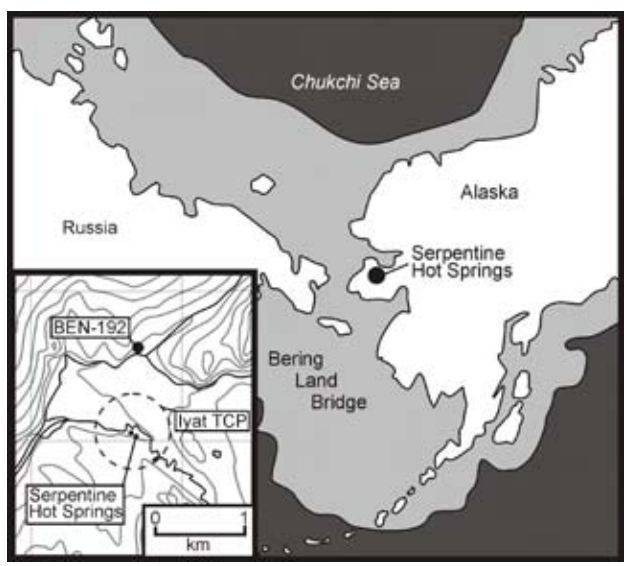

Figure 1. Map showing locations of Serpentine Hot Springs and archaeological site BEN-192.

Research Background

The context of our research focuses on the dispersal of modern humans from Eurasia to America during the late Pleistocene (Goebel 1999; Goebel et al. 2008), especially from an archaeological perspective. We are interested in determining the origins of the first Americans, and our research in Alaska involves three activities: (1) defining who the first human inhabitants of Beringia were, (2) chronicling their origins in northeast Asia and their subsequent spread into Alaska, and (3) explaining variability between stone-artifact assemblages in Beringia. Our research at BEN-192 focuses on the significance of fluted points in Alaska, especially in the context of these three broad problems. During the 2009 field project at Serpentine Hot Springs, the specific question we hoped to answer was this: does BEN-192 hold the key to defining the age and explaining the origins of Alaskan fluted-point technology?

In temperate North America, fluted points are diagnostic of the Clovis complex and have been convincingly shown to date to as early as 13,200 cal BP (Waters et al. 2007). Fluted points occur in other Paleoindian complexes as well, and archaeologists have documented that many differences in fluting technology existed during the latest Pleistocene of North America. Chief among these are differences between Clovis and Folsom (Collins 1999), but other fluted variants include Gainey, Barnes, Cumberland, and "western fluted" (Beck and Jones 2007; Stanford et al. 2004). Some of these forms are imprecisely dated; however, all are typically assumed to be coeval with or slightly younger than the Clovis complex. The origins and spread of these and other fluted-point complexes are not well-understood; a possibility is that some or all emerged from a Beringian ancestor.

In Alaska, numerous fluted points have been recovered (Bever 2001; Clark 2001; Clark and Clark 1993; Dixon 1993; Dixon and Smith 1986) (Figure 2), but their antiquity remains uncertain. Some of the points come from surface sites that cannot be dated; others come from shallowly buried sites where dated materials cannot be clearly tied to the points. At Girls Hill, fluted points were

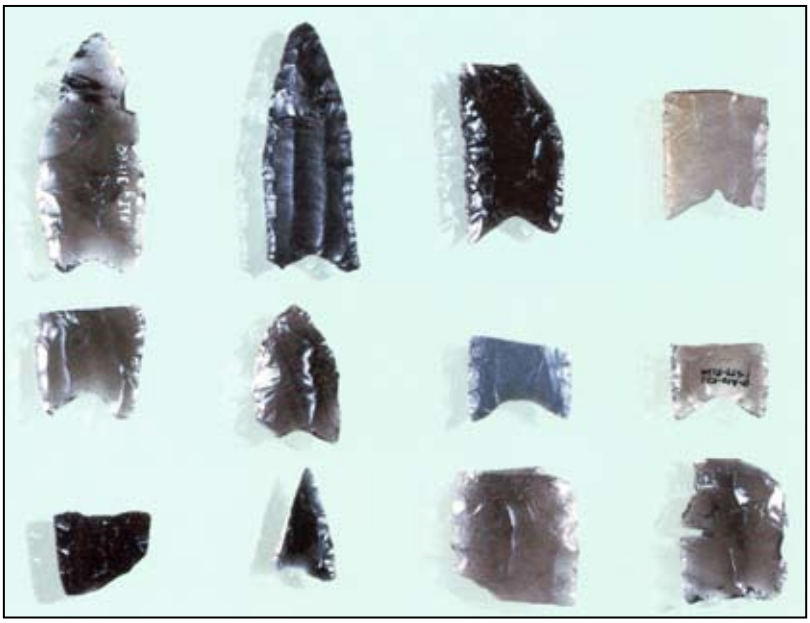

Figure 2. Examples of fluted points from Alaska (from Dixon 1993).

associated with charcoal ^{14}C dated to ~5100 cal BP (Reanier 1995), and at Putu, charcoal associated with fluted points yielded ^{14}C ages spanning 6500-13,300 cal BP (Alexander 1987; Reanier 1995). In both cases the points came from very shallow contexts, and the dated charcoal could not be shown to be the product of human activity. At Batza Téna, obsidian-hydration estimates range between 1800-21,600 BP (Clark and Clark 1993), and at Bonanza Creek they range between 700-1800 BP (Hamilton and Goebel 1999). Also, an early obsidian-hydration date of 12,300 ± 1700 BP was obtained from a fluted point from the North Fork of the Koyukuk River (Hamilton and Goebel 1999), but this date has a large standard deviation and is not very enlightening. At face value, these dates suggest that fluted points in northern Alaska persisted well into the Holocene, but more likely the late charcoal dates and low hydration measures are due to post-depositional effects of fire (Friedman 1994; Hamilton and Goebel 1999).

Most archaeologists hypothesize that Alaskan fluted points date to younger than Clovis points in temperate North America, because of technological differences between the two groups (Bever 2001; Dixon 1993; Dumond 2001; Hoffecker and Elias 2007). Alaskan points typically have triple flutes on both faces and concave bases with distinct corner "ears". South of Beringia, such fluted points are difficult to find, but the point from Charlie Lake Cave, British Columbia, is similar. Associated ^{14}C dates suggest an age of ~12,000 cal BP for this specimen (Fladmark et al. 1988), suggesting that northern fluted points may be post-Clovis in age. These results, though, need to be tested with independent chronological evidence from Alaska as well as detailed, continent-wide analyses of fluted-point morphologies and technologies (Clark and Clark 1993).

Through the analyses carried out at BEN-192 in 2009, we have found that the site contains a fluted-point assemblage in a buried and datable context, and through careful excavation and dating of the site we have been able to provide the first chronological benchmark for the Alaskan fluted-point complex. Further, analyses of fluted-point form and technology at BEN-192 also have provided much needed evidence about the relationship of Alaska's fluted points with temperate North America's fluted points. Based on our findings at BEN-192, Alaska's fluted points do not appear to have been ancestral to Clovis, but instead represent a "backwash" of the technology from temperate North America during post-Clovis times. Continued research at the site may provide evidence to further examine whether the late appearance of fluted-points in Alaska resulted from the spread of a human population or just the transmission of the technology across already existing northern populations.

Site Mapping

Our mapping activities focused on two tasks, both carried out with a Sokkia SET630R total-station theodolite. First, we collected topographic and surface feature data (consisting of about 900 points) across the entire site area, on a rough 10-m grid, to map the site in its local context. This mapping exercise included the two loci of the site (i.e., the area where lithic artifacts occur only on the surface of the ground and the area where excavations yielded artifacts from a buried context) as well as bedrock exposures, surface blowouts, vegetation changes, and the nearby unnamed creek. Second, we collected topographic and feature data (about 160 points) in the area immediately surrounding the archaeological excavation, on a rough 3-m grid, to prepare a finer-scaled close-up map of the main site area where fluted-point fragments have been recovered in a buried context.

The resulting large-scale topographic map is presented in Figure 3. It shows that the site is situated along a gently sloping ridge near a southeast-facing bedrock bluff that overlooks the surrounding Serpentine Hot Springs area. Two loci are apparent, a northern locus where lithic artifacts

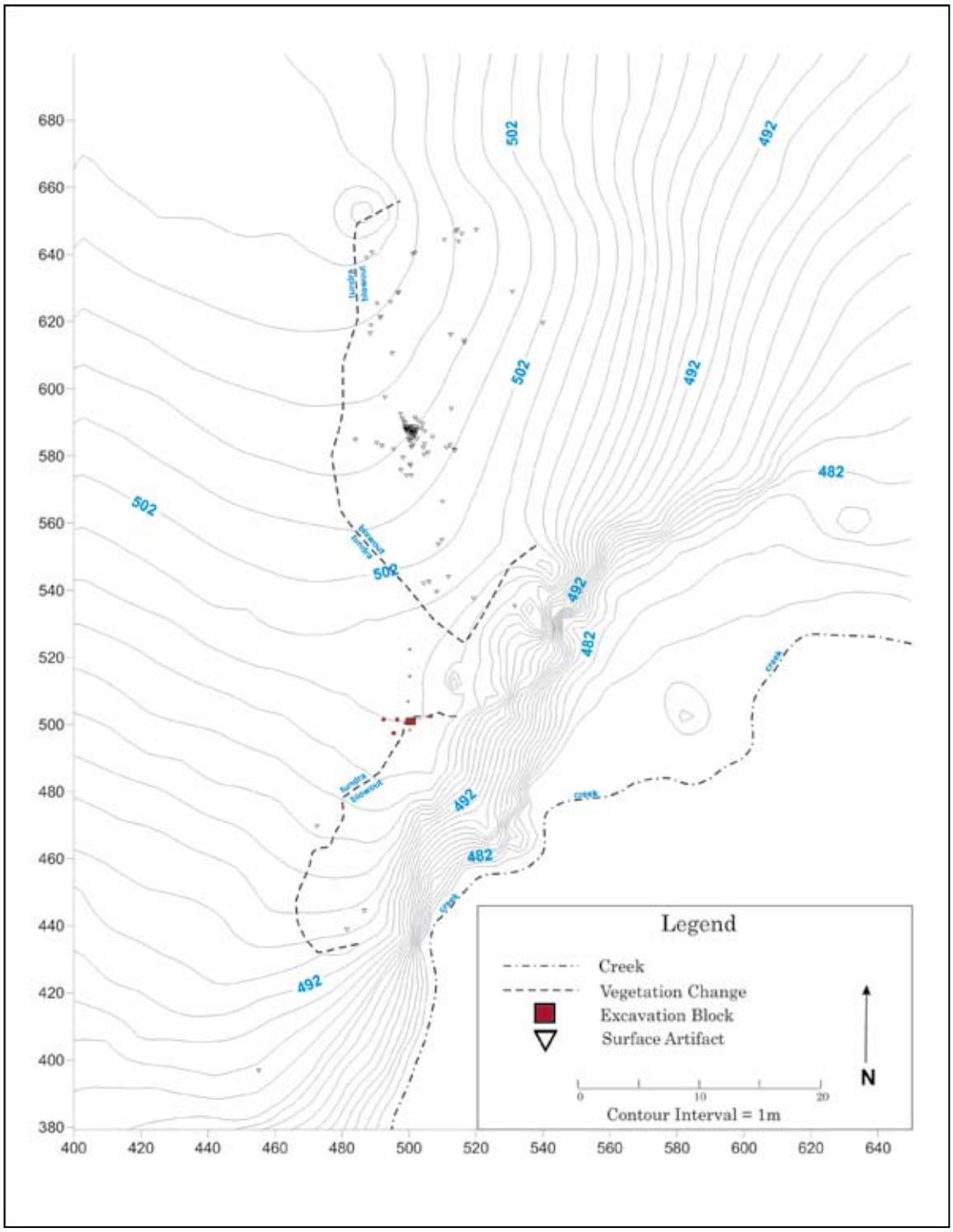

Figure 3. Contour map showing topographic situation of BEN-192, as well as provenience of surface-collected artifacts and excavation units.

Figure 4. Aerial view of BEN-192. Arrow points to excavation locus. Light tan-colored area above arrow is the locus of the site from which most surface finds occurred.

occur in surface blowouts, and a southern locus where they occur in a buried context. These occur at an elevation of about 21-25 m above the nearby stream. The map also shows provenience of individual lithic artifacts recovered from the site surface as well as locations of excavation units, which are described in more detail below. Figure 4 further illustrates the setting of BEN-192.

We also collected data to prepare a finer-scaled map of the excavation area, collecting data points on a rough 5-m grid. The resulting map is shown in Figure 5. It shows that the excavated locus of BEN-192 is situated upon a gently sloping bench of a south-sloping bedrock ridge, immediately above an east-facing cliff face. About 12-15 m northeast of the excavation is a 2-m high granite-bedrock tor, which juts out of the top of the east-facing cliff. Figure 5 also shows that the main excavation block straddled a significant change in the character of the surface. North and west of the dashed line, the surface of the ground was mantled by a shrub-tundra vegetation community, while south and east of the line, the surface was exposed with little vegetation, characteristically a blow-out area. The vegetated area of the site contained the buried archaeological component, while the blow-out area contained only artifacts on the surface of the ground. The excavation grid for BEN-192 is shown in Figure 6.

Surface Survey

Surface archaeological survey focused on recovery of lithic artifacts to define the boundaries of the site and to recover a representative sample of tools and debitage. For the surface survey, we thoroughly investigated the entire site area using east-west-running 3-m transects. We identified 117

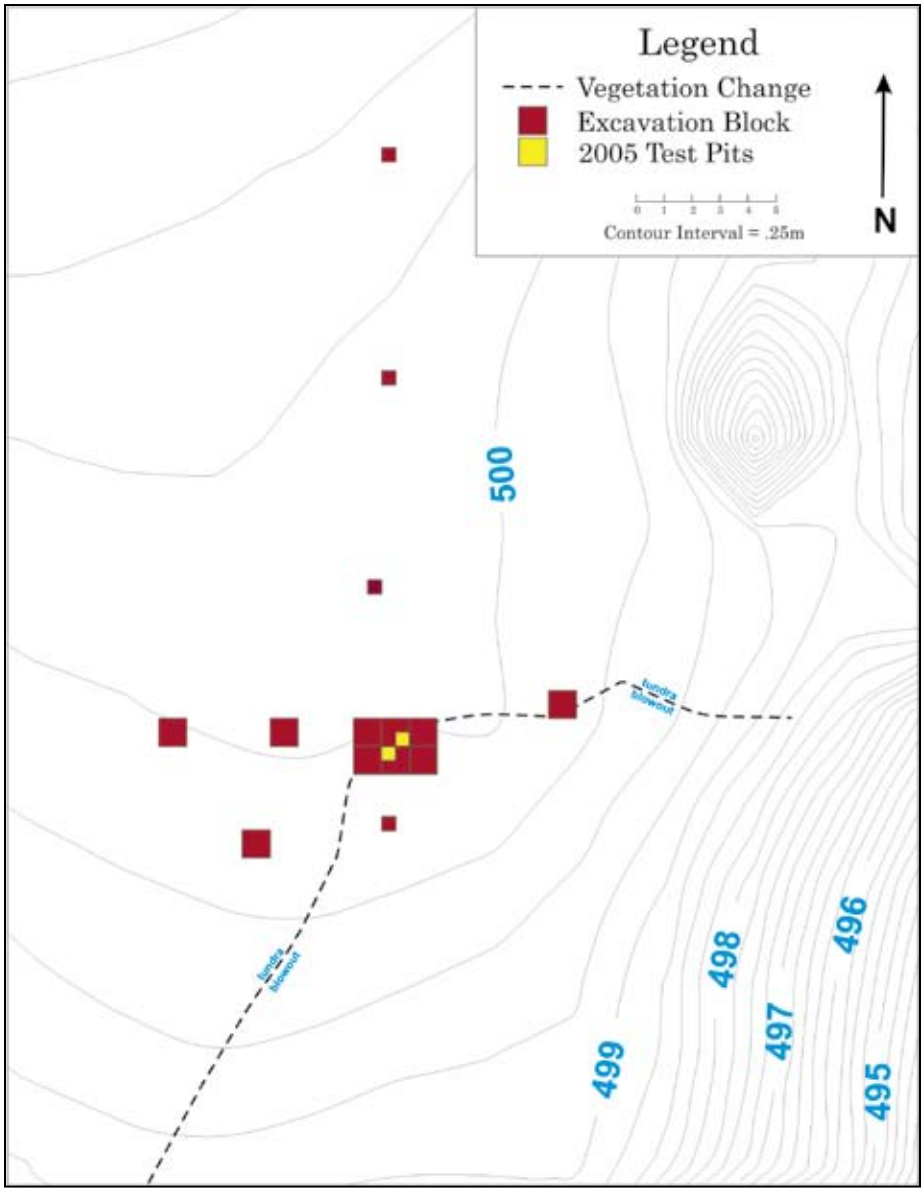

Figure 5. Close-up contour map of excavation locus at BEN-192, showing topographic situation and placement of excavation units.

artifacts, recording each artifact's three-point provenience with our Sokkia total-station theodolite. Locations of these surface finds are shown on the topographic map in Figure 3.

Lithic artifacts were distributed along the entire ridge of the site, from a largely eroded granite knob marking the northern boundary of the site (about N650 on the grid), to the lower part of the gentle slope upon which the site is situated (about N400 on the grid). A noticeable concentration of lithic artifacts occurred between gridpoints N580-N600 and E490-E520 (Figure 7).

We collected all 115 artifacts identified on the surface, including both tools and debitage. Briefly, these included two fluted-point fragments, ten biface and bifacial point fragments (two of which refit back together), one flake tool (a multiply-spurred graver), and 102 debitage pieces. Of the two fluted-point fragments, one is a midsection that bears multiple flutes on both faces (Figure

8, top right [BELA-34108]), while the second is a basal fragment that is multiply-fluted on just one face (Figure 8, bottom right [BETA-34172]). Gridpoints for the two fluted-point fragments recovered from the surface of BEN-192 were N537.52/E519.29 for the midsection fragment and N613.62/E516.63 for the basal fragment. The other biface fragments are undiagnostic. These and the debitage assemblage collected from the surface of BEN-192 are described in the "Artifact Assemblages" section of the report below.

Excavations and Geoarchaeological Results

Our excavations included a 6-m^2 block, four 1-m^2 test units, and five 50-cm^2 test units (Figures 3, 5, 6, and 9). The 6-m^2 block was placed at the location of the original fluted-point discovery, to further investigate whether artifacts occurred there in a buried and datable context. The other test units were systematically placed around this area to help define the lateral extent of recognized stratigraphic units and site boundaries. Lithic artifacts were encountered in every excavation unit, with the exception of the three 50x50-cm units north of gridline N507.

In the excavations, unconsolidated geological deposits reached 70 cm in depth (Figures 10-15). Stratigraphically, we defined a series of gruss deposits interdigitated with grussy silts. The lower gruss deposit is a regolith while the upper grusses appear to be secondary, relating to the downslope redeposition of the original gruss regolith. The grussy silts may be loess deposits with occasional pebble-sized inclusions resulting from occasional slopewash or bioturbation. Besides the modern soil, two paleosols mask the deposits. Both paleosols are represented by buried, weakly developed A and B horizons. Across the various excavation units, the two paleosols were separated in some areas but mixed together in others, primarily by rodent digging but also solifluction. Nearly all artifacts occurred in the lower paleosol, and when we encountered artifacts in the upper paleosol, they were typically in rodent-affected areas.

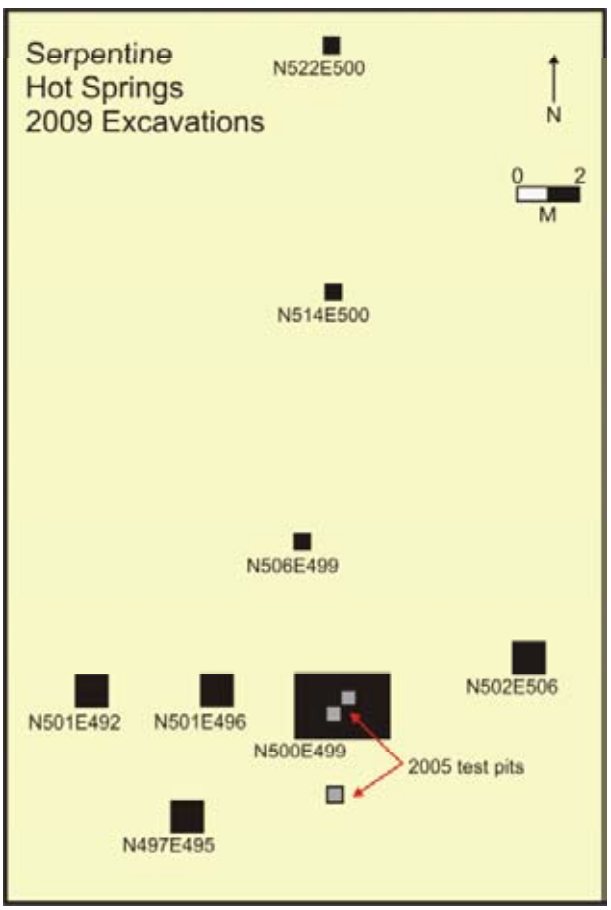

Figure 6. Map of 2009 excavations at BEN-192, showing grid points of excavation units (grid labels refer to southwest corner of units).

In all four of the 1-m^2 test units (N497E495, N501E492, N501E496, N502E506), we encountered artifacts primarily in the lower paleosol, and in two of these test units (N501E492, N501E496) we found associated charcoal. The only 50x50-cm test unit to yield artifacts was N506E499; the other three 50x50-cm test units, located farther to the north, did not yield artifacts but nonetheless provided valuable geomorphic information about the lateral extent of the artifact-bearing deposits. In none of the three did we encounter the

Figure 7. View of surface locus at BEN-192. Yellow flags mark locations of surface finds.

Figure 8. Fluted-point fragments from Serpentine Hot Springs area (top left: distal fragment from BEN-170; top right: medial fragment from surface of BEN-192; bottom left: basal fragment from surface of BEN-192, collected in 2005; bottom center: basal corner fragment from 2009 excavation of BEN-192; bottom right: basal fragment from surface of BEN-192).

Figure 9. Excavation of BEN-192. Foreground shows 2x3-m excavation block, and background (left) shows locations of two 1x1-m test pits.

paleosols. Instead, these deposits seemed to occur only within the main site area in the vicinity of the block excavation. Each of the test pits that produced artifacts as well as the 6-m^2 excavation block are described in detail below.

N497E495

The excavation of test pit N497E495 reached a depth of about 30 cm (Figure 10). From the top-downwards, deposits included a modern soil reaching about 10 cm in thickness. It contained weak but discernible O, A, and B horizons. Below this was a buried soil with discernible A and B horizons together reaching about 5-to-10-cm thick, and below this was a gruss deposit reaching about 15 cm thick, at the base of the profile. Within the basal gruss, an intermittent buried A horizon also occurred, and in the upper paleosol, pockets of gruss were encountered. N497E495 yielded six debitage pieces, and lenses of charcoal were mapped in the lower gruss, potentially in association with the lower buried paleosol.

N501E492

The excavation of N501E492 reached about 35 cm in depth. The upper 10 cm of the test pit's profile (Figure 11) constituted the O, A, and B horizons of the modern soil, all weakly developed. Within the B horizon were pockets of gruss, likely colluvial in origin; otherwise, the uppermost 25-30 cm of the profile were silts interpreted to be aeolian in origin. Two paleosols also occurred in this test pit. The upper paleosol occurred between elevations of about 499.75 and 499.67 m, and

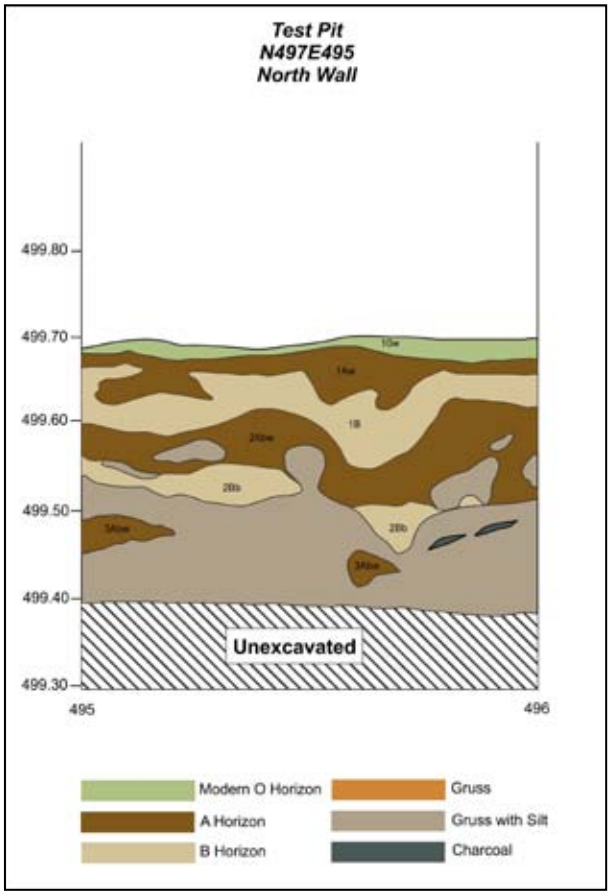

Figure 10. Stratigraphic profile of N497E495.

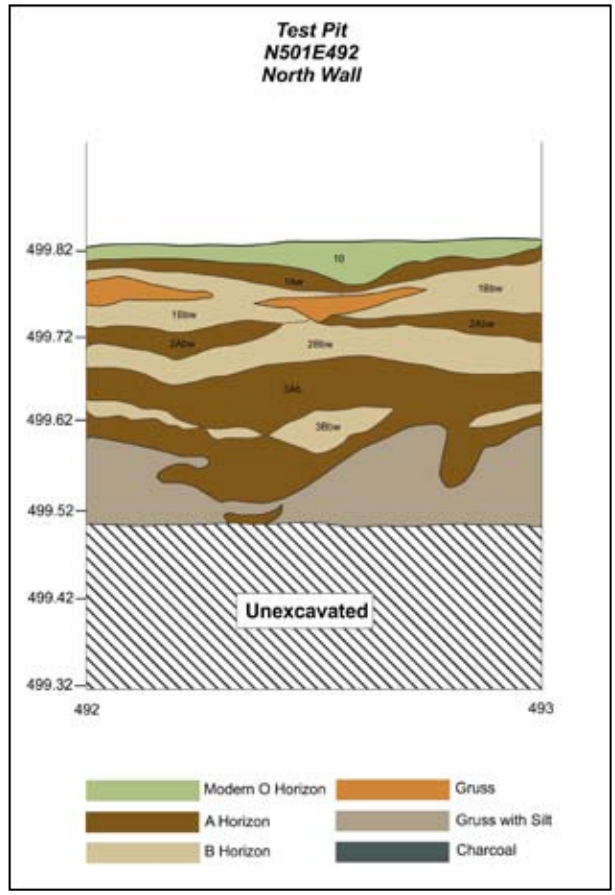

Figure 11. Stratigraphic profile of N501E492.

the lower paleosol occurred between elevations of about 499.67 and 499.57. The lower 7-10 cm of the test pit, finally, consisted of gruss in a silt matrix. Like test pit N497E495, the lower deposits were heavily soliflucted. Artifacts recovered from N501E492 include five debitage pieces and one core tablet presumably from a small blade core. All of these were associated with the lower paleosol.

N501E496

Like in the other test pits, the stratigraphic profile of N501E496 contained a modern soil that reached about 10 cm in thickness. It contained a surface O horizon and a weakly developed A horizon and B horizon. Two paleosols also occurred, both marked by buried A horizons that were weakly developed, and both heavily soliflucted. The paleosols masked silt with occasional inclusions of gruss, and in places we encountered lenses of silty gruss within the buried A horizon of the upper paleosol, at depths ranging between about 499.63-499.61 m in elevation. A lens of charcoal also occurred at the base of the lower paleosol, and at the base of the excavation there was a 5-cm-thick layer of silty gruss. Better sorted gruss occurred under this, as shown in the northeast part of the test pit's profile (Figure 12). Our excavation of N501E496 yielded seven debitage pieces. Among them was a channel flake and bladelet, both made on chert. Figure 16 shows the completed excavation of test pit N501E496, before backfilling.

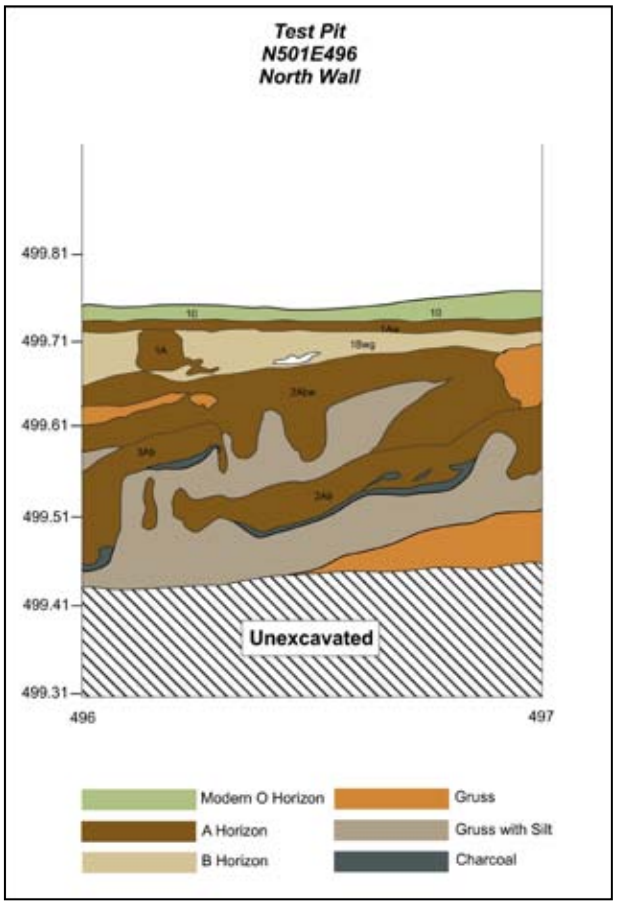

Figure 12. Stratigraphic profile of test pit N501E496.

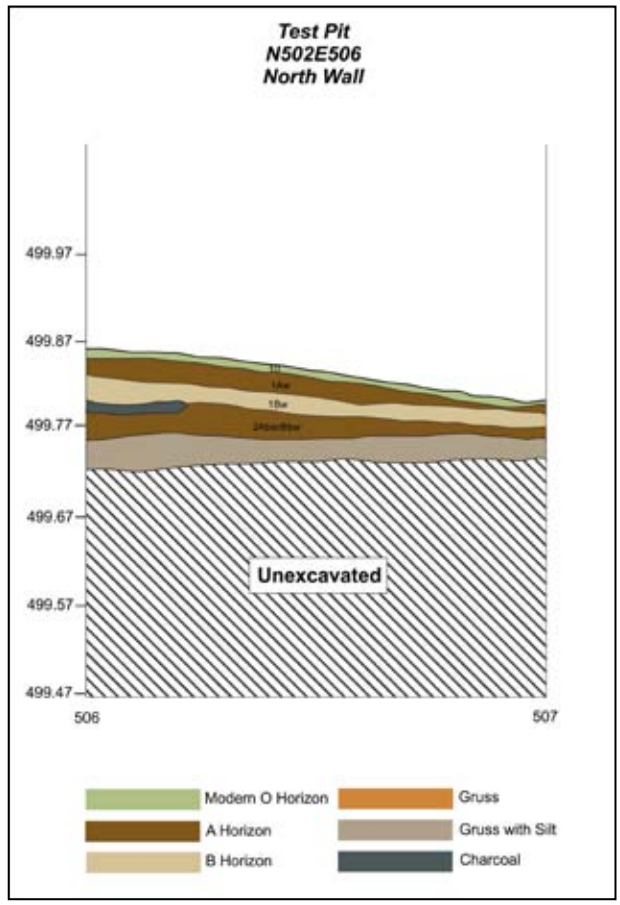

Figure 13. Stratigraphic profile of test pit N502E506.

N502E506

Test pit N502E506 was placed along the eastern margin of the buried locus of the site. In this area, upper silt deposits thinned considerably (in comparison to the rest of the locus), reaching only ~10 cm in thickness. The profile in Figure 13, from the top-downward, shows the modern soil (O, A, and B horizons), a thin buried A/B horizon, and a silty gruss. N502E506 yielded two debitage pieces and a flake core on a cobble.

Excavation Block

The 6-m^2 excavation block included the following excavation units: N500E499, N500E500, N500E501, N501E499, N501E500, N501E501 (Figure 17). We placed this excavation over the area where NPS archaeologists discovered the original fluted-point fragment, and where they excavated two corner-connected 50-cm^2 test pits in 2005 (Figure 9). The excavation block also incorporated the vegetation change shown in Figure 9, so that the southeastern area of the block (N500E501) was devoid of shrub-tundra vegetation and turned out not to have the finer silt deposits that contained the buried cultural component across the rest of the excavation.

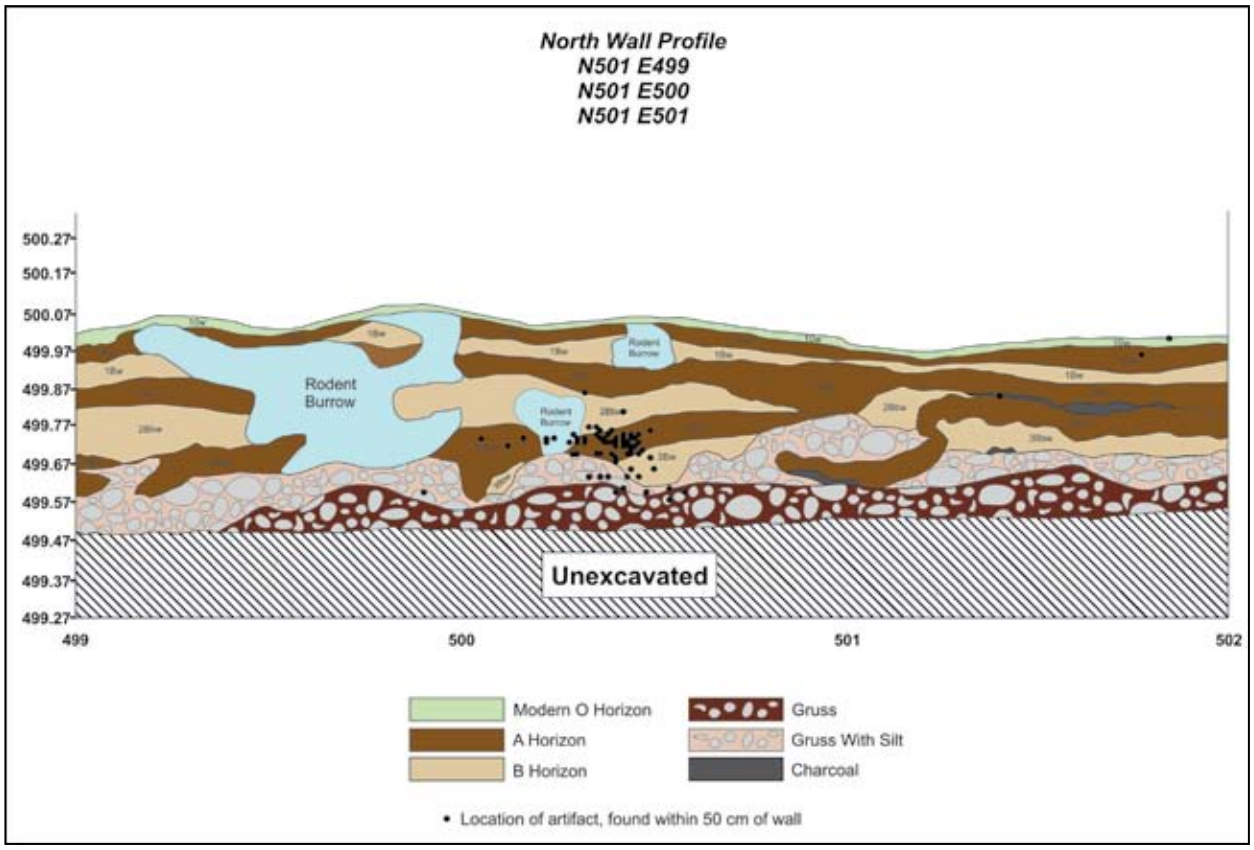

Figure 14. Stratigraphic profile of north wall of 2x3-m excavation block, showing provenience of artifacts recovered from within 50 cm of wall.

Excavations in the block reached 50-60 cm in depth. Geologic stratigraphy of the excavation block for the most part was similar to that of the nearby test pits, except that there were more signs of bioturbation (i.e., rodent burrowing) in the excavation block. Briefly, the top 30-40 cm of loose sediment in the excavation consisted chiefly of silts with varying amounts of gruss inclusions, but soliflucted lenses of silty gruss also occurred. Across most of the excavation, we exposed about 10 cm of well-sorted gruss, which we interpreted to represent the weathered regolith of the granite bedrock underlying the site. The silt deposits were masked by the modern soil, an upper paleosol, and a lower paleosol. The modern soil contained a clear O horizon and weakly developed A horizon, and both paleosols contained weakly developed A and B horizons. The involutions of gruss apparent in the profiles (Figures 14 and 15) were unweathered and thus are interpreted to have been soliflucted into place after the development of the site's buried soils. The lower set of silts (underlying the modern soil horizons) was heavily soliflucted.

In the 6-m^2 block, we recovered 132 debitage pieces, one basal corner fragment of a fluted point (Figure 8, middle of bottom row), and five other biface fragments (two of which conjoin). Among the debitage pieces were four bladelets/microblades and two channel flakes. These are presented in more detail later in the report. We also exposed and mapped a soliflucted hearth feature in the lower paleosol (Figures 18 and 19). The hearth was post-depositionally disturbed, but despite not being lined with stones, we could easily distinguish its perimeter while excavating, and it showed up clearly in cross-section. The feature consisted of abundant charcoal flecks and

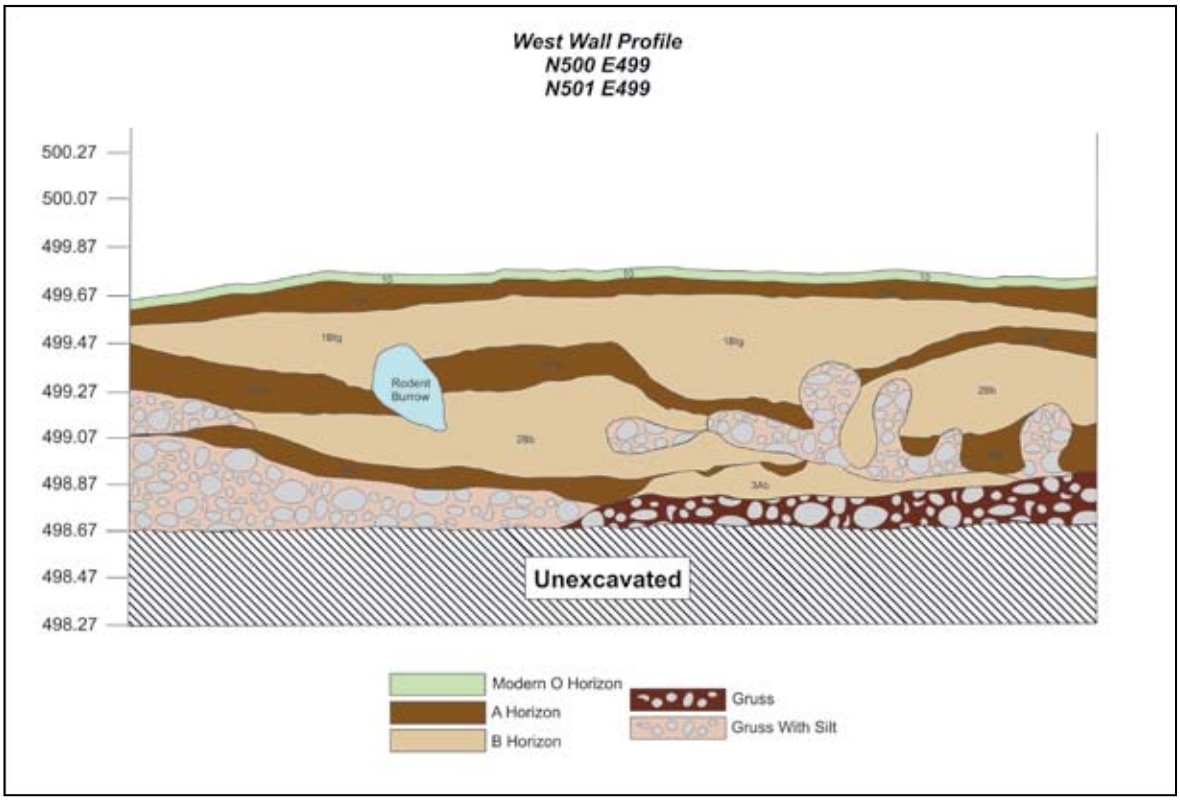

Figure 15. Stratigraphic profile of west wall of 2x3-m excavation block.

Figure 16. Test pit N501E496*, upon completion of excavation (and north wall of test pit).*

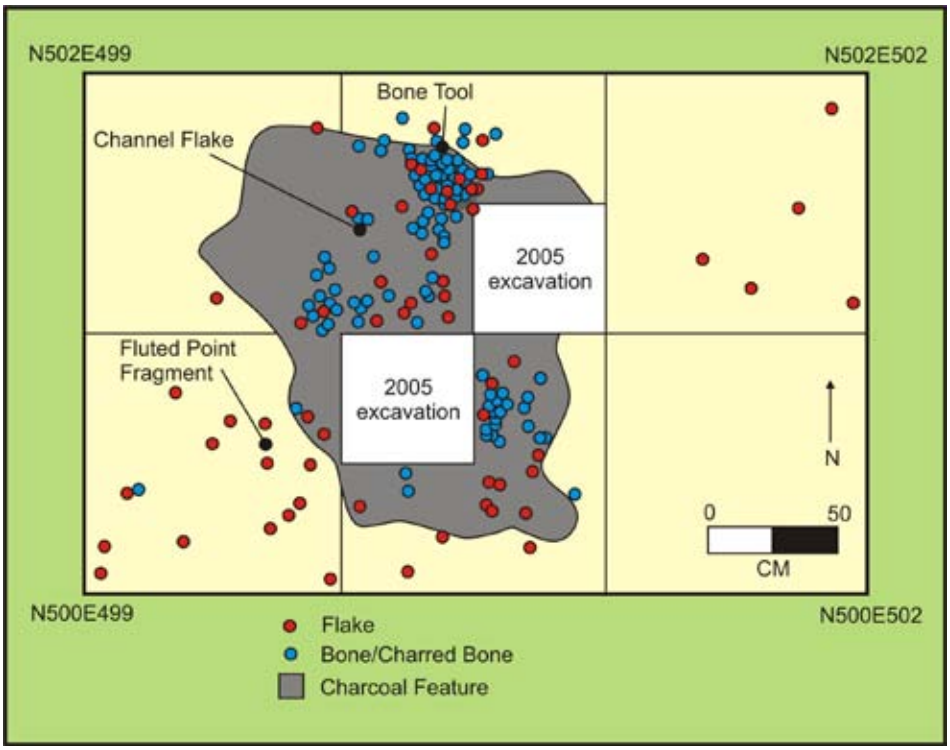

Figure 17. Map showing outline of hearth feature and associated artifacts and bones, exposed in 2x3-m excavation block.

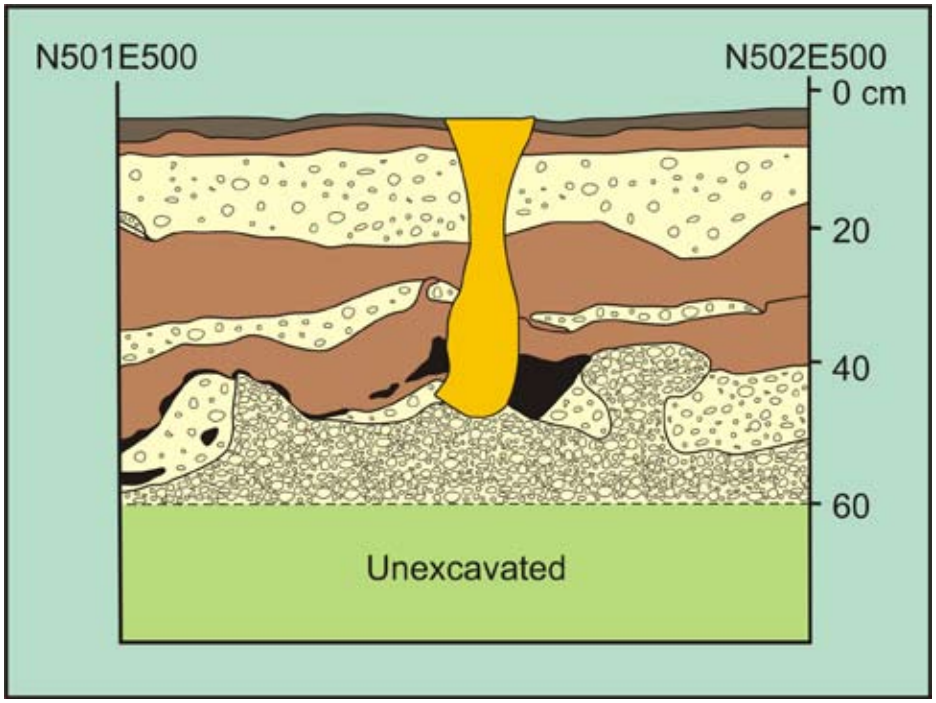

Figure 18. Stratrigraphic profile of west wall of square N501E500, in 2x3-m excavation block. Black areas below lower paleosol represent the hearth feature shown in Figure 17. Yellow vertical "shaft" in center of profile is cross-section of trowel probe excavated in 2005.

very dark gray-brown to black colored silt. Stratigraphically, the hearth feature occurred within the lower paleosol, and it was directly associated with many of the lithic artifacts, as well as hundreds of tiny bone fragments, provisionally indentified by Bryan Hockett (zooarchaeologist, U.S.D.I. Bureau of Land Management, Elko Nevada Field Office) as ungulate. The fluted-point base was recovered about 10 cm away from the hearth edge, and one channel flake and several fire-altered lithic flakes were recovered from within the hearth feature itself.

50-cm² Test Pits

We excavated 50-cm² test pits along a north-south-running grid line, extending from the established site datum, to investigate further the lateral extent of the site's artifact-bearing deposits. Test pit N506E499 contained the same suite of sediments as described above for the excavation units around the main site locus; however, the other more northerly test pits (at grid points N514E500, N522E500, and N599E488) did not contain these deposits. Instead their stratigraphic profiles were dominated by silty grusses likely of colluvial origin. Only N506E499 yielded artifacts—three debitage pieces.

Dating

At the time of this writing, we had four new ^{14}C dates to report for BEN-192 (Table 1). In Fall 2009 we submitted charcoal samples to Stafford Research, Inc., in Boulder, Colorado, for accelerator ^{14}C analysis. Stafford Research, Inc., conducted sample pretreatments, and the accelerator facility at University of California-Irvine conducted accelerator ^{14}C analyses. Two samples (UCIAMS-77097 and 77098) were from the hearth feature in square N501E500, and the other two came from the lower paleosol preserved in test pit N501E492.

Three of the four dates fall between 9900 and 10,000 ^{14}C BP, and together they indicate that the lower paleosol at BEN-192, as well as the hearth feature, date to this time, or approximately 11,400-11,200 cal BP. The fourth date, 9375 ± 25 ^{14}C BP, is significantly younger than the other dates, but stratigraphically it came from lower than the other date on the hearth feature (9940 ± 25 ^{14}C BP). T. Stafford (pers. commun., 11 May 2010) reported that the younger date was very different morphologically and chemically from the others. While the three older samples survived the final nitric acid step in pretreatment, the younger sample almost did not, yielding only 0.9 mg of

Table 1. Radiocarbon Dates from the 2009 Excavation at BEN-192.

Lab Number	Date	Material	Horizontal Provenience (m)	Vertical Provenience (m)
UCIAMS-77095	9920 ± 25	charcoal	N501.42 E492.59	499.62
UCIAMS-77096	9960 ± 25	charcoal	N501.76 E492.53	499.61
UCIAMS-77097	9940 ± 25	charcoal	N501.10 E500.42	499.75
UCIAMS-77098	9375 ± 25	charcoal	N501.13 E500.39	499.69

carbon from a sample that originally weighed 63 mg. The younger sample acted more like poorly charred wood than hard charcoal (as the other three acted). We interpret this to mean that the younger sample may have been some natural wood material, possibly a small fragment of a root, that had post-depositionally penetrated into the hearth feature.

Young and Gilbert-Young (2007) previously reported dates on charcoal of 9480 ± 40, 10,250 ± 60, 10,060 ± 40, and 10,250 ± 60 ^{14}C BP, from respective elevations of 30-32, 36, 37, and 39 cm below the surface of their 50x50-cm test pit that turned out to have penetrated through the hearth feature (Figure 17). Despite the differences between our new dates and Young and Gilbert-Young's previous dates, all of them together suggest that the age of the hearth and associated artifacts is roughly 10,000 ^{14}C BP (or 11,500-12,000 cal BP). We will analyze more charcoal samples from the hearth feature as well as the other test pits in the months to come, and will report any resulting dates to the National Park Service as they become available.

Artifact Assemblages

In the descriptions that follow, the artifact assemblage from our 2009 investigations of BEN-192 are separated into two sub-assemblages, one from the surface of the site and the other from excavations.

Surface Assemblage

The complete surface assemblage from 2009 includes 102 debitage pieces and 13 tools. Among the debitage pieces, cherts (82.4%) and chalcedonies (6.9%) are most common, while quartz (4.9%), schist (2.9%), diabase (2.0%), gneiss (1.0%), and obsidian (1.0%) are rare (Figure 20). Items with cortex are on chert (n = 1), chalcedony (1), schist (1) diabase (1), and gneiss (1). The most frequently occurring classes of debitage are retouch chips (45%) and flakes (42%) (Figure 21), but most of the flakes are actually untypeable flake fragments (83.7%) (Table 2). Cortical spalls (4.9%) and angular shatter (4.9%) are uncommon, and bladelets (2.0%) (Figure 22k) and microblades (1.0%) (Figure 22i-j) are rare. No cores or technical spalls from cores were recovered during the surface survey. Table 2 shows the distribution of debitage types. Significant but rare debitage types include three channel flakes and one bipolar flake.

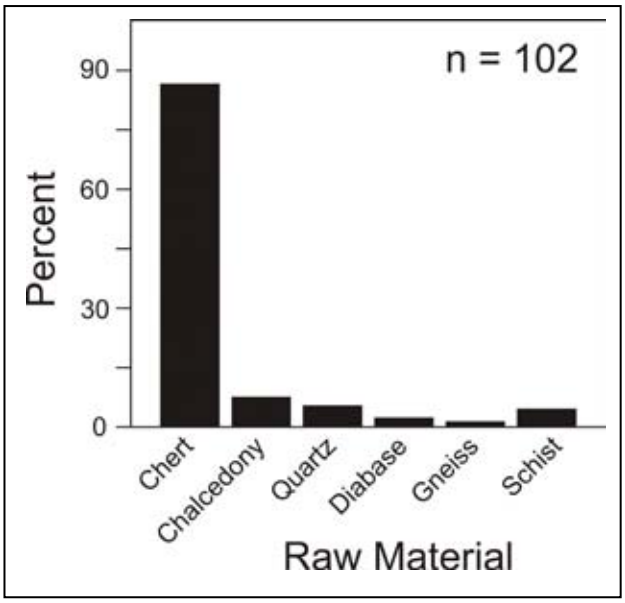

Figure 20. Distribution of raw materials in surface assemblage from BEN-192.

Of the 13 tools recovered during our 2009 surface survey, two are fluted-point fragments, ten are non-diagnostic biface or bifacial point fragments, and one is a multiple spurred graver. These are described in more detail below.

One of the two fluted-point fragments, BELA-34108, is the midsection of a fluted point made

Table 2. Debitage Types Recovered from the Surface of BEN-192.

Debitage Category	Chert	Chalcedony	Other Raw Material	Total
Flake				
Flake fragment	34	2	0	36
Complete flake	4	0	2	6
Bipolar flake	0	0	1	1
Cortical spall				
Primary cortical spall	1	0	2	3
Secondary cortical spall	0	1	1	2
Retouch chip				
Retouch chip fragment	10	1	0	11
Retouch chip	5	0	0	5
Biface-thinning flake	23	3	1	27
Channel flake	2	0	1	3
Angular shatter	2	0	3	5
Bladelet				
Proximal blade fragment	1	0	0	1
Medial blade fragment	1	0	0	1
Microblade				
Medial microblade fragment	1	0	0	1
Total	84	7	11	102

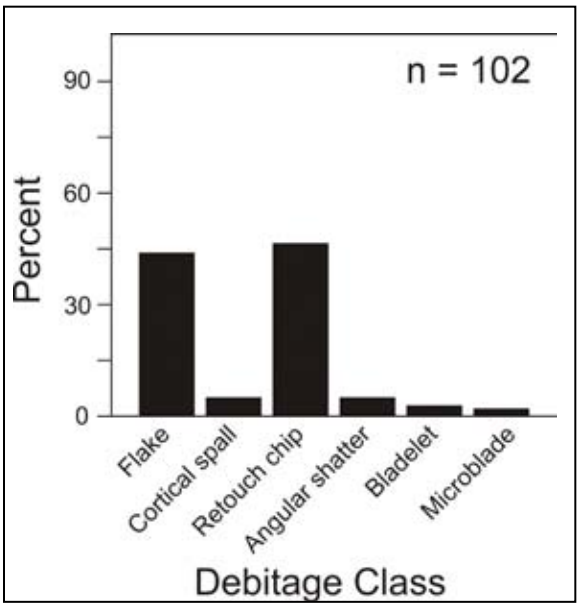

Figure 21. Distribution of major debitage categories in surface assemblage from BEN-192.

on gray-brown chalcedony (Figure 22a). One of its faces bears traces of three flutes, while the obverse face has one, possibly two flutes. Its lateral margins are finely trimmed, and there is no evidence of flaking along the margin after the point had been fluted. The point's two breaks appear to have been snaps, occurring either during manufacture or use, and there is no evidence that either break is an impact fracture. There is enough of the point preserved to show that its margins expand upwards from the base, that its width was at least 22.54 mm, and that its thickness was at least 6.53 mm.

The second fluted point (BELA-34172) is a basal fragment made on gray chert (Figure 22b). One of its faces has a single major flute and two possible minor flutes that flank the major flute, while the obverse face was not fluted. The unfluted face has lateral flake scars that travel to the midline of the point, creating a lenticular cross-section. The lateral and basal margins of the point are straight,

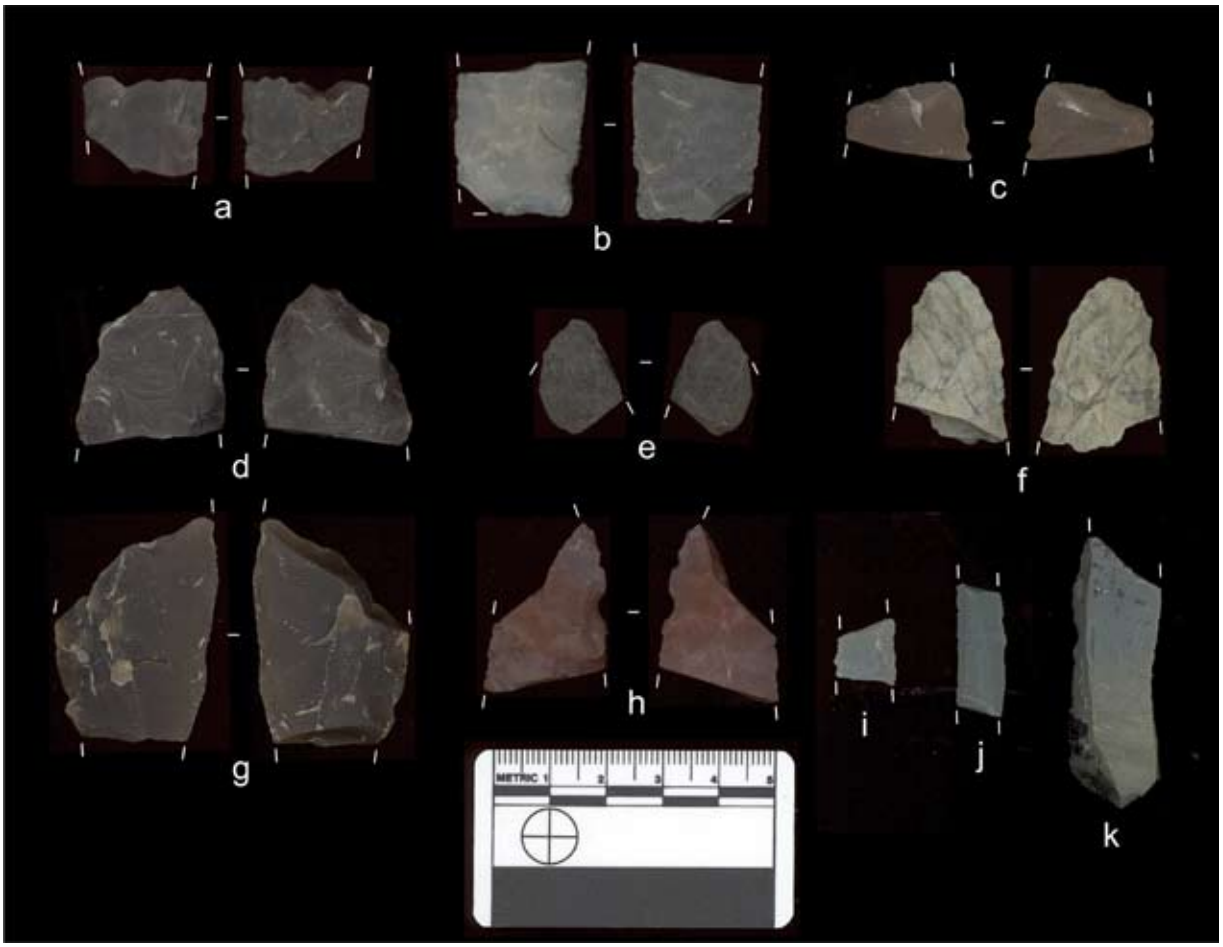

Figure 22. Artifacts recovered from the surface of BEN-192 (a-b, fluted-point fragments; c-h, bifacial point or late-stage biface fragments; i-k, bladelet/microblade fragments).

carefully trimmed, and lightly ground. Along the base, small trimming flake scars obliterated the proximal end of the flute. One of the basal corners is broken, perhaps from impact; the fracture scar rotates from the corner onto the unfluted face of the point. Similarly, the distal break extends onto the unfluted face and appears to have been the result of the point breaking upon impact as a projectile. Enough of the point is preserved to tell that its lateral margins expand upwards from the base, that its width was at least 23.29 mm, and that its thickness was at least 7.09 mm. The point's basal width is 21.05 mm.

Data on the ten biface fragments are summarized in Table 3. Eight different raw materials are represented, all cherts or chalcedonies. Four of the bifacially worked tools appear to be tip fragments, three are mid-section fragments, and three are edge fragments (each with a segment of a lateral margin preserved). All of them served either as finished tools or were broken late in production (Figure 22c-h). All four of the tip fragments and two of the mid-section fragments show impact damage resulting from their use as projectiles. These damage features include impact fractures on breaks, deeply hinged flake scars originating from point tips, and, in one case, an impact burin originating from a point tip.

Table 3. Bifaces Recovered from the Surface of BEN-192.

Accession No.	Biface Type	Raw Material	Comment
34110	Midsection fragment	Tan-gray chalcedony	Impact fracture on one end
34115	Tip fragment	Tan-gray chalcedony	Impact damage on tip
34124	Lateral fragment	Tan-gray chert	Break follows vein in rock
34130	Tip fragment	Light-gray chert	Impact fracture
34133	Probably tip fragment	Dark gray chert	Burin on tip
34136	Midsection fragment	Maroon chert	Snaps on both ends
34166	Tip fragment	Light gray chert w/ streaks	Impact fracture
34167	Midsection fragment	Tan-gray chalcedony	Possible impact flake scar with deep hinge
34205	Lateral fragment	Light green-gray chert	

The multiply-spurred graver is made on a small biface-thinning flake of gray chert. It is worked nearly completely on the dorsal face, and it bears two clear graver spurs and two other possible spurs that are broken or worn down.

Excavated Assemblage

The complete excavated assemblage from 2009 includes 162 debitage pieces and five tools. These are described briefly below.

The excavated debitage assemblage (n = 162) is dominated by cherts and chalcedonies, together making up 94% of the assemblage, while quartz (3.7%), quartzite (1.2%), and diabase (1.2%) are uncommon (Figure 23). The origins of the cherts, chalcedonies, and quartz are currently unknown, but only one such artifact has cortex on it (0.6%), suggesting that the artifacts on these materials were made elsewhere and transported to BEN-192 in late-stage or finished forms. Half of the quartzite and diabase artifacts bear cortex, suggesting that these raw materials were locally procured, but we cannot know this for sure without conducting a detailed toolstone survey of the Serpentine area.

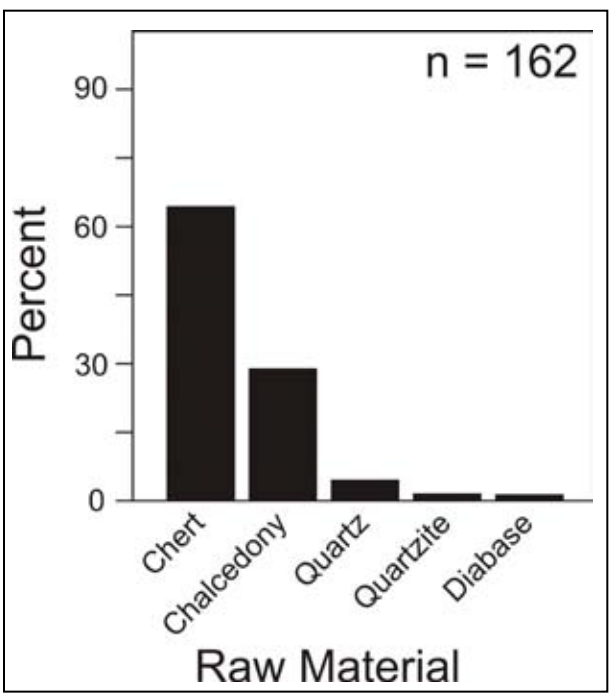

Figure 23. Distribution of raw materials recovered from the excavation at BEN-192.

In terms of debitage class (Figure 24), the excavated assemblage consists chiefly of retouch chips (66.1%) and small flakes (23.5%). Angular shatter and cortical spalls are uncommon (2.5% and 1.9%, respectively), and only one core was recovered. This is a simply prepared flake core on a cobble of diabase. Other debitage classes include a single bladelet, seven small blades preliminarily labeled microblades (Figure 25e-i), and one core tablet that appears to have been removed

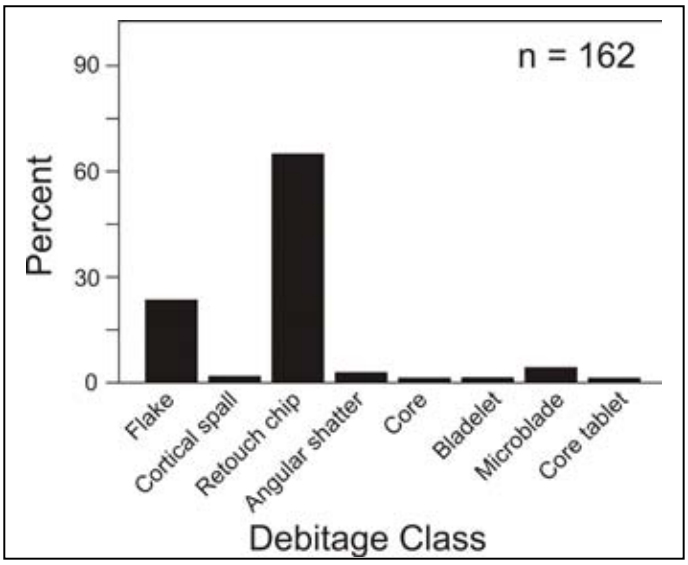

Figure 24. Distribution of debitage classes represented in the excavated assemblage from BEN-192.

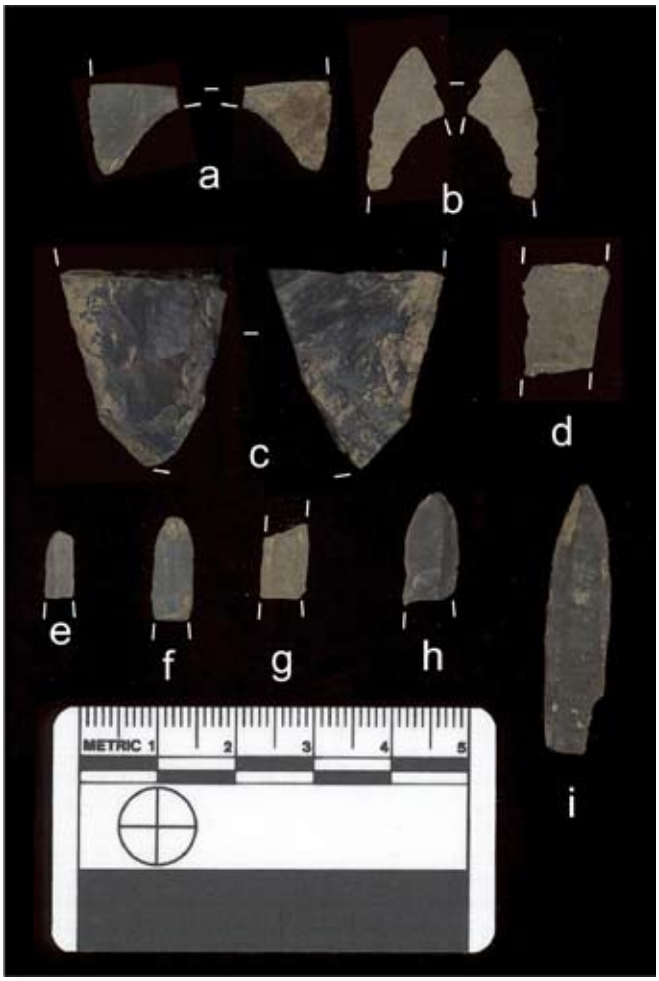

Figure 25. Artifacts recovered from 2009 excavation at BEN-192 (a, basal fragment of fluted point; b-c, bifacial point or late-stage biface fragments; d, channel flake fragment; e-h, microblade fragments; i, bladelet).

Table 4. Debitage Types Recovered from the Excavation of BEN-192.

Debitage Category	Chert	Chalcedony	Other Raw Material	Total
Flake				
Flake fragment	22	9	2	33
Complete flake	3	0	2	5
Cortical spall				
Secondary cortical spall	1	0	2	3
Retouch chip				
Retouch chip fragment	23	17	1	41
Retouch chip	7	2	0	9
Biface-thinning flake	34	18	2	54
Channel flake	1	2	0	3
Angular shatter	4	0	0	4
Core				
Flake core	0	0	1	1
Core tablet	1	0	0	1
Bladelet				
Complete bladelet	1	0	0	1
Microblade				
Proximal microblade fragment	4	0	0	4
Medial microblade fragment	3	0	0	3
Total	104	48	10	162

from the top of a small bladelet/microblade core. The core tablet, though, is irregularly shaped and not diagnostic of any specific microblade-core technology.

Among debitage types, two interesting patterns occur within the retouch-chip class (Table 4). First, biface-thinning flakes are the most common type of retouch chip in the assemblage (making up 86% of the type-able retouch chips), while tiny smooth-platformed chips (i.e., pressure flakes) are much less common (14%). Second, three channel flakes occur; one on chert and two on chalcedony. These came from the block excavation (in association with the hearth feature) as well as from one of the test pits.

Our 2009 excavation yielded five flaked-stone tools, including the basal-corner fragment of a fluted point and four non-diagnostic biface fragments. The fluted point fragment (BELA-34230) constitutes a basal corner made on gray-green chert (Figure 25a). Both faces show signs of two flute scars, its lateral and basal margins were carefully trimmed and ground, and the arrises of the flute scars are weakly abraded, perhaps from hafting. Its thickness is 2.70 mm. The four biface fragments are made on four different varieties of chert. The first fragment (Figure 25c) is made up of two conjoined pieces (BELA-34453 and BELA-34532) of dark gray chert. The degree of flaking and condition of the biface's margin suggest that it was from a late-stage or finished biface; however, the fragment does not appear to have been part of the biface's hafted element. Its edge is somewhat dull, perhaps from use. The second fragment (Figure 25b) appears to be the tip fragment

of a finished bifacial point (BELA-34246). It is made on gray-green chert (like the fluted point described earlier in this paragraph) and bears a "potlid" likely from heat damage. BELA-34400 is a nondescript biface fragment on gray chalcedony that appears to have come from a late-stage or finished biface, and BELA-34401 is an edge fragment of a late-stage or finished biface made on tan-gray CCS. Neither of these bifaces shows signs of a hafting element; however, they are very small fragments.

BEN-170

At nearby BEN-170, which is located about 500 m north of Serpentine Hot Springs and 50 m east of Arctic Hot Springs, R. Gal, M. Waters, and S. Slobodin conducted a brief reconnaissance, flagging 19 artifacts for later collection. On the last day of our fieldwork, Goebel located Gal's datum and subdatum and used these points to three-point provenience and collect the flagged artifacts. Chief among them was the tip fragment of a fluted point made on a light tan-gray chert and bearing a single flute on one face (Figure 8, top left). Among the other artifacts recovered from BEN-170 was a double-sided side scraper made on chert. Time constraints kept us from producing a topographic map of the site; however, this will be accomplished in 2010 if we can return to the site.

Discussion

Even though this report is preliminary and our results will potentially change as we continue excavations and complete analyses in the laboratory, we can make some tentative conclusions about BEN-192 and its contents.

1. Site Contexts. The northern locus of BEN-192 is essentially a surface locus; any artifacts found there in a buried context are likely redeposited into much older gruss. The southern locus of the site, however, does contain lithic artifacts in a buried, stratified context. Most artifacts are associated with a lower paleosol; however, a few have also been found associated with an upper paleosol. Whether these represent two separate cultural components, or a single component that has been minimally disturbed through bioturbation and solifluction, is not yet clear. Additional excavations will be necessary to solve this problem; however, we tentatively conclude that the site is a single-component site, and that artifacts in the upper paleosol are likely redeposited. BEN-170, finally, does not appear to contain buried cultural deposits.

2. Site Age. Four new radiocarbon dates reported here suggest that the lower paleosol and hearth feature exposed in the 2009 excavations date to around 10,000 ^{14}C BP (12,000 cal BP). These conform well with dates previously obtained from the hearth feature, and together they provide an age for its formation and the deposition of the artifacts and bones associated with it. Among these associated artifacts were a fluted-point fragment, channel flakes, and small bladelets/microblades. We conclude that at BEN-192 these artifacts date to the very end of the Pleistocene, c. 11,500-12,000 cal BP. There is a small discrepancy of several hundred years between the new dates and the two oldest previously obtained dates, however, and to understand why we will need to analyze more charcoal samples from the hearth feature. Further, continued dating of the lower (and upper) paleosol units is required, so that we can understand the paleoclimatic context of the formation of these ancient soils.

There is no indication of a later Holocene occupation of either BEN-192 or BEN-170, at least in as far as the typological character of the recovered lithic assemblage suggests. In fact, NPS surveys in the Serpentine area have failed to locate any post-7000-^{14}C-BP sites (typologically defined) (R. Gal, personal communication, 2009).

3. Excavated Artifact Assemblage. Among the artifacts recovered from the block and test excavations were one fluted-point fragment, three channel flakes, seven possible microblades, and a possible microblade core tablet, all from the lower paleosol. Associated debitage suggests that technological activities focused on late-stage production and resharpening of bifacial fluted points as well as the manufacture of small blades or microblades. The "possible microblades" are quite large for standard microblades systematically produced from small wedge-shaped microblade cores, so that they may represent some other bladelet-microblade core technology in which larger bladelet cores were reduced sequentially into smaller-sized cores, eventually yielding smaller-sized bladelets which could be metrically classified as microblades. Without a core, however, it is difficult to say much about the technology used to produce the small blades from BEN-192.

4. Fluted Points. In total, four fluted-point fragments have been recovered from BEN-192 and a fifth from BEN-170. Two of them are basal fragments with deeply concave bases and triple flutes on both faces, while a third basal fragment is fluted on just one face. There is also the mid-section of a fluted point from BEN-192 and a tip fragment of a fluted point from BEN-170. All of these point fragments are made on cherts, the origins of which are presently unknown. They do not appear to have been locally procured, however, and in the field R. Gal indicated that some may have come from northwest Alaska.

Conclusions. Thus, BEN-192 contains a buried and well-preserved cultural component preliminarily dated to about 10,000 ^{14}C BP (11,500-12,000 cal BP). Our testing suggests the site extends across an area of more than 50 m^2, and that the fluted-point component occurs in a stratigraphically sealed paleosol. Lithic tools and debitage, hearths, and faunal remains are preserved; their continued excavation and study offer an unprecedented opportunity to investigate the technological, subsistence, and settlement organization of some of the earliest human occupants of the Seward Peninsula region of the Bering Land Bridge.

At 11,500-12,000 cal BP, the human-produced hearth feature at BEN-192 provides the first clear evidence of Pleistocene-aged humans on the Seward Peninsula, Alaska. As befitting this status as the first Ice-Age monument of the Bering Land Bridge National Preserve, it should come as no surprise that the diagnostic artifact recovered in association with that hearth is a fluted point, the hallmark of the Paleoindian period of temperate North America. Surprisingly, however, this first clearly dted fluted point of the Bering Land Bridge is 1000 years younger than Clovis fluted-point forms in the south. The implication of this finding is that fluted points in arctic North America represent a back-migration of Paleoindians, or back-diffusion of Paleoindian technology, from more southerly latitudes.

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