# PREHISTORIC UPLAND TOOL PRODUCTION IN THE CENTRAL ALASKA RANGE

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## ABSTRACT

The Bull River II site represents an important alpine tool production site in the central Alaska Range south of Broad Pass. Initial test excavations produced a sizable lithic assemblage and charcoal dated to the Younger Dryas. A lithic analysis comparing Bull River II and the undated Costello Creek assemblages reveals biface production was the primary activity at both locations. Discovered at relatively high elevations (>1000 m.a.s.l.), the sites reflect an underrepresented Eastern Beringian site type related to upland resource procurement and offer a basis for testing seasonal land-use models.

**KEYWORDS:** central Alaska, Younger Dryas, lithic analysis, upland hunting

## INTRODUCTION

Strategically positioned south of Broad Pass, the Bull River II site contains evidence of hunter-gatherer tool production and technological preparation for upland hunting. Initial AMS radiocarbon results date the occupation to the Younger Dryas and comparisons of artifact attributes with the nearby but undated Costello Creek site indicate a remarkable consistency in flint-knapping behaviors. The sites represent high elevation (>1000 m.a.s.l.) prehistoric assemblages relevant to wider interpretations of early prehistoric land use and subsistence strategies.

In Eastern Beringia, the Pleistocene-Holocene boundary is arguably the most thoroughly documented archaeological period (Goebel and Buvit in press; Hamilton and Goebel 1999; Holmes 2001; West 1996; Wygal 2003; Yesner 1996). However, archaeological interpretation remains limited because a preponderance of existing evidence is derived from a narrowly defined site type and, to a lesser extent, setting (i.e., south-facing overlooks in the Tanana and Nenana river valleys). Subsistence and land-use models for central Alaska would benefit from a wider range of sites from multiple topographic settings.

### UPLAND HUNTING

The central Alaska Range has yielded few prehistoric alpine sites with the exception of the Tangle Lakes Archaeological District where the Alaska Office of History and Archaeology (OHA) has been monitoring melting ice patches in the Amphitheater Mountains east of Cantwell (VanderHoek et al. 2007a, 2007b). While ice patch discoveries offer fascinating contextual data on upland kill sites in central Alaska, none of the Tangle Lakes ice patch finds predate 1100 cal BP (VanderHoek et al. 2007a). An incised antler projectile point dated to 7310±40 BP (8110±50 cal BP) from a southern Yukon ice patch suggests that early Holocene upland hunting occurred in some parts of Eastern Beringia (Helwig et al. 2008). Denali National Park and Preserve developed survey strategies aimed at locating logistical support sites such as toolstone procurement or weapon production and repair occupations in alpine zones near ice patch settings (Wygal and Krasinski 2010).

## STUDY AREA

The Bull River II and Costello Creek sites are located in southeastern Denali National Park and Preserve, 27 km southwest of Cantwell and 8 km northeast of the West Fork Chulitna River where a complex network of small upland ponds and tributaries drain the mountains buttressing Easy Pass (Fig. 1). This region has both precipitous peaks and gentle ridges that reach in excess of 1400 m.a.s.l. with a seasonal abundance of resources including upland game, berries, and toolstone. Winter months are harsh with deep snow, high winds, and frigid temperatures. Soil formation is generally consistent with 40 to 60 cm of silt and clay capping basal layers.

While, the specific glacial history of Bull River and Costello Creek remains undocumented the Carlo glacial advance dates between 19,000 and 17,200 years ago based on terrestrial cosmogenic nuclides and optically stimulated luminescence on glacial erratics in the nearby Nenana Valley (Dortch 2006). Glaciers retreated from the summit of the Reindeer Hills east of Cantwell between 16,600 and 15,500 years ago and from the valley floor between 19,000 and 17,200 years ago (Briner and Kaufman 2008; Dortch 2006). Less extensive glacial readvances in Broad Pass during the Younger Dryas (Dortch 2006) probably did not hinder human migration between the north and south slopes of the Alaska Range.

Present vegetation cover is a blend of low shrub alpine tundra consisting of berries, lichens, and flowers. Dense patches of dwarf birch thrive at lower elevations along major drainages and south-facing slopes. Faunal communities include caribou (*Rangifer tarandus*), grizzly bear (*Ursus arctos*) and the occasional black bear (*U. americanus*). Dall sheep (*Ovis dalli*), beaver (*Castor canadensis*), red fox (*Vulpes vulpes*), wolf (*Canis lupus*), hare (*Lepus* sp.), ground squirrel (*Spermophilus parryii*), and ptarmigan (*Lagopus*

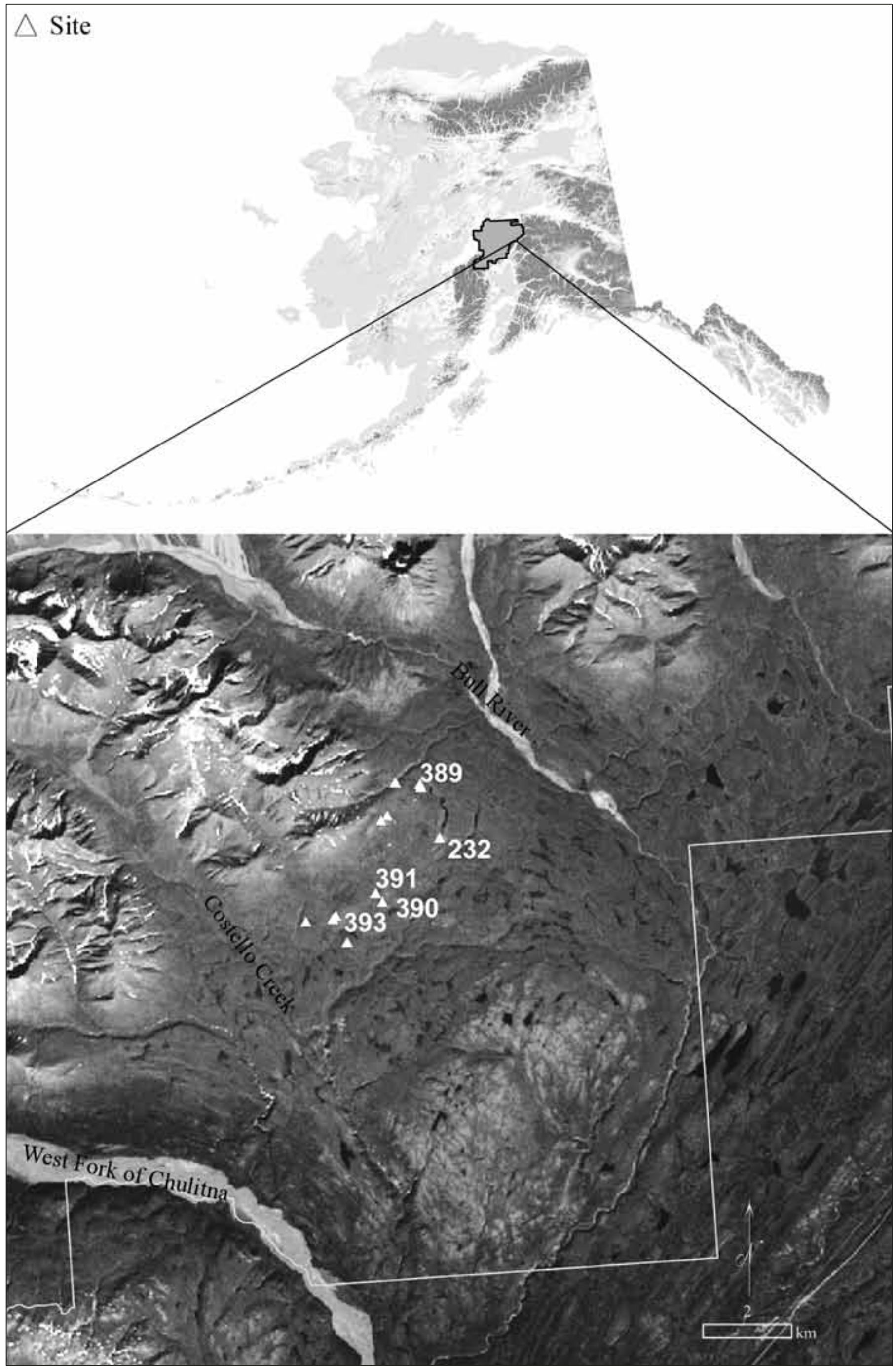


***Figure 1. Location of Denali National Park and Preserve (top) and sites mentioned in text labeled by the last three digits of the Alaska Heritage Resources Survey (AHRS) numbering system (bottom). The National Park boundary is in white. Note extensive upland snow and ice patches at higher elevations.***

sp.) are common, while moose (*Alces alces*) frequent the brushy river bottoms. No known fish species live in the small streams or ponds of the study area.

Situated on a north-south trending bench at an elevation of 1031 m.a.s.l., Bull River II and at least two additional sites overlook a small beaver-dammed tributary of Camp Creek. Less than 100 m north of the site, a western tributary of the Bull River is fed by melting snowfields above. Prehistoric hunters may have been attracted to the area because it offers a commanding view of the lowlands with easy access to fresh water, toolstone, and upland resources. With no single ideal camp location along the 2 km bench, deposition of palimpsest assemblages was probably limited.

The Costello Creek site is located halfway between the headwaters of Camp Creek and Costello Creek, 2.5 km southwest of Bull River II. At 1039 m.a.s.l., the Costello Creek site occupies a small, undistinguished knoll at the base of a larger hill.

## RESEARCH HISTORY

In 1988, Lynch (1996) conducted aerial and pedestrian survey in the foothills north of Dunkle Mine and west of the Bull River as one facet of a larger park-wide investigation primarily aimed at documenting historic sites. During this survey, three waste flakes and a small possible microblade core were documented at HEA-232 on the same ridge containing Bull River II. Black chert, dark gray chert, white chalcedony, and obsidian were recorded among the small artifact assemblage. Surface finds were not collected and a test pit excavated nearby yielded no subsurface artifacts (Griffin 1990:245; Lynch 1996; Saleeby 2000:420).

In 2007, Denali National Park and Preserve and the University of Nevada, Reno initiated an intensive archaeological survey of the region surrounding HEA-232 (Wygal and Krasinski 2010). The work yielded eleven new prehistoric sites ranging from small surface scatters to extensive buried deposits. No evidence of microblade technology was found. Biface and bifacial flake fragments were recovered from the majority of these sites. Bull River II and Costello Creek were considered most substantial of the newly recorded sites and underwent careful evaluative test excavations. At both sites, artifacts were piece-plotted in three dimensions using metric tape measures and a line level from a central datum. Excavation was undertaken in 5-cm arbitrary levels with meticulous documentation of stratigraphic transitions and artifact provenience. Sediments were screened through one-eighth-inch wire mesh.

## STRATIGRAPHY AND DATING

This initial stratigraphic assessment from Bull River II and Costello Creek represents the sites' depositional history derived from common soil and texturing charts (Midwest Geosciences Group n.d.a, n.d.b). Initial observations suggest stratigraphic similarities between the sites; however, full sedimentological and geomorphological studies have yet to be completed.

### BULL RIVER II

Bull River II contains five broadly defined stratigraphic layers (Fig. 2) consisting of aeolian deposits overlying the basal stratum. The uppermost layer, stratum 5, is comprised of a thin vegetation root mat from 0–3 cm below the ground surface. The organic horizon (stratum 4) is particularly dark with a high concentration of gray silt deposits at 10–15 cm below the surface. Tentatively identified as heavily weathered tephra, these silts contain a small percentage of angular glass shards observed in the field through a 10x hand lens. Although further research is necessary, the silt in stratum 4 may represent the nearby Cantwell ash identified at the Carlo Creek site (Bowers 1979) and later incorporated into the widespread Hayes

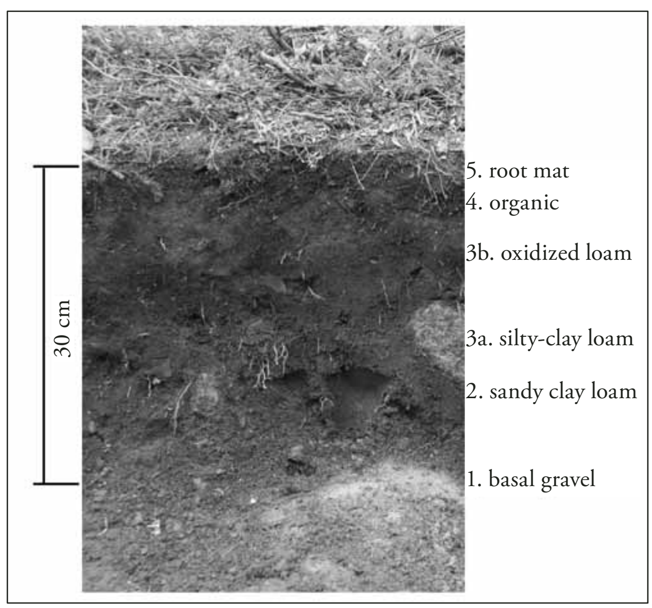


*Figure 2. Stratigraphic profile at Bull River II.*

tephra (Riehle et al. 1990). The Hayes tephra is the most extensive tephra deposit across southcentral and central Alaska, and was deposited in a series of eruptions between 4,300 and 3,800 cal BP (Begét et al. 1991; Riehle et al. 1990). Recently, the Hayes tephra has been found in cores from Wonder Lake and Sneaker Pond north of the Alaska Range in Denali National Park where Child et al. (1998) obtained a maximum bracketing age of 4250±100 cal BP (3830±60 BP).

Stratum 3b is a heavily oxidized red-brown silty clay loam deposit forming a distinct crusted barrier that seals the cultural components below. The cultural zone at Bull River II is contained within stratum 3a, a compact, organic-rich, black and brown mottled remnant O-horizon. The majority of artifacts (73%) were recovered near the base of stratum 3a at a depth of 22–27 cm below the surface (28–34 cm below datum). Stratum 2 consists of a thin sandy clay loam and the basal layer (stratum 1) is nonuniform unsorted colluvium with round boulders, angular shatter, and fractured schist mixed in a sandy loam matrix.

Although no faunal remains were recovered, portions of the original occupation surface at Bull River II have remained relatively well preserved. Artifact frequency increased with depth below surface while artifact pitch (vertical orientation) decreased. Based on current evidence, windblown sediments slowly buried artifacts deposited onto the stratum 3a surface. Vertically oriented artifacts were transported upward in the profile into stratum 3b through cryoturbation.

Documented near the base of stratum 3a were two small charcoal clusters in association with discolored soil, organic staining and concentrations of *in situ* artifacts (Fig. 3). Specimens of the charred wood fragments have been submitted for genus and species identification. Samples of the organic stains were wrapped in aluminum foil and sealed in Ziploc bags. Once out of the field, the

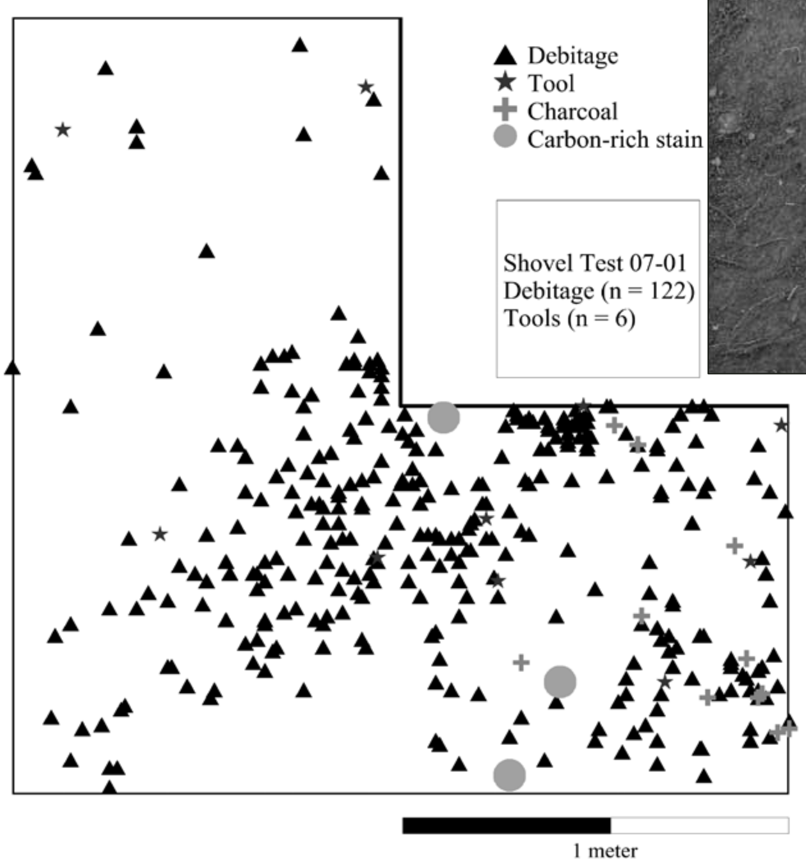


***Figure 3. Point-provenienced artifacts and charcoal samples from Bull River II. Photo inset (top right) depicts the cultural horizon with* in situ *artifacts and associated charcoal.***

samples were air dried for seventy-two hours and repackaged in fresh foil and dry bags. John McCormack of the Department of Geological Sciences and Engineering at the University of Nevada, Reno characterized the elemental composition of the samples using a scanning electron microscope (SEM) equipped with an energy-dispersive detector. Elemental analysis of individual particles indicated a composition of aluminum (Al), silicon (Si), oxygen (O) and an unusually high level of carbon (C). While the Al signature originated from foil used to collect the samples, Si and O occurred in amounts consistent with standard kaolin-type clay soils. The unusually high levels of carbon were abnormal for natural soil formation (McCormack, pers. comm. 2008).

The charcoal and carbon-rich staining identified at Bull River II was the only evidence of charred material observed in greater than one thousand subsurface tests from this survey region. Several of the charcoal fragments were in excess of 2 cm in diameter, but most of the wood fragments measured between 1 and 2 cm. The charcoal clustered within the culture zone and in close proximity to *in situ* artifacts and organic-rich resinous features. While natural processes such as lightning strike or tundra fire may have deposited the charred wood remains, the parsimonious explanation attributes the charcoal to a small remnant hearth because there is no obvious evidence of regional tundra fires. Four individual fragments were dated between 12,500 and 12,200 cal BP (Table 1), coincident with the Younger Dryas and Dry Creek component II (Powers and Hoffecker 1989), making Bull River II one of the earliest known human occupations in an Alaska alpine setting and south of the Alaska Range divide.

***Table 1. Radiocarbon data from the Bull River II site.***

| Lab Number | $^{14}$C BP | $\delta^{13}$C | Cal BP* |
|---|---|---|---|
| BETA234748 | 10,310±50 | –26.7 | 12,180±150 |
| BETA234749 | 10,350±50 | –24.6 | 12,260±150 |
| BETA234746 | 10,460±50 | –25.4 | 12,410±150 |
| BETA234747 | 10,490±50 | –26.7 | 12,460±140 |

***Note: Calibrated using CalPal05 and the Intcal04 curve at one sigma (Weninger and Jöris 2004). All dates are AMS on single charcoal fragments.***

**COSTELLO CREEK**

The excavation at Costello Creek revealed a similar but deeper stratigraphic profile than Bull River II (Fig. 4). Stratum 5 is a relatively thin root mat that terminates near the ground surface. Gray silts (potential tephra) within the organic horizon (stratum 4) are more prominent at Bull River II than Costello Creek. Stratum 3 is comprised of a brown silty clay loam deposit; the heavy oxidation prevalent at other sites in the region was not as pronounced at the Costello Creek site. The majority of artifacts occurred in the lower levels of stratum 3 near its contact with the underlying stratum 2. Stratum 2 is a sandy clay loam horizon and is thicker than at Bull River II. The basal layer (stratum 1) is comprised of a sandy loam colluvium with unsorted pebbles and boulders. The assemblage remains undated although further investigations are planned.

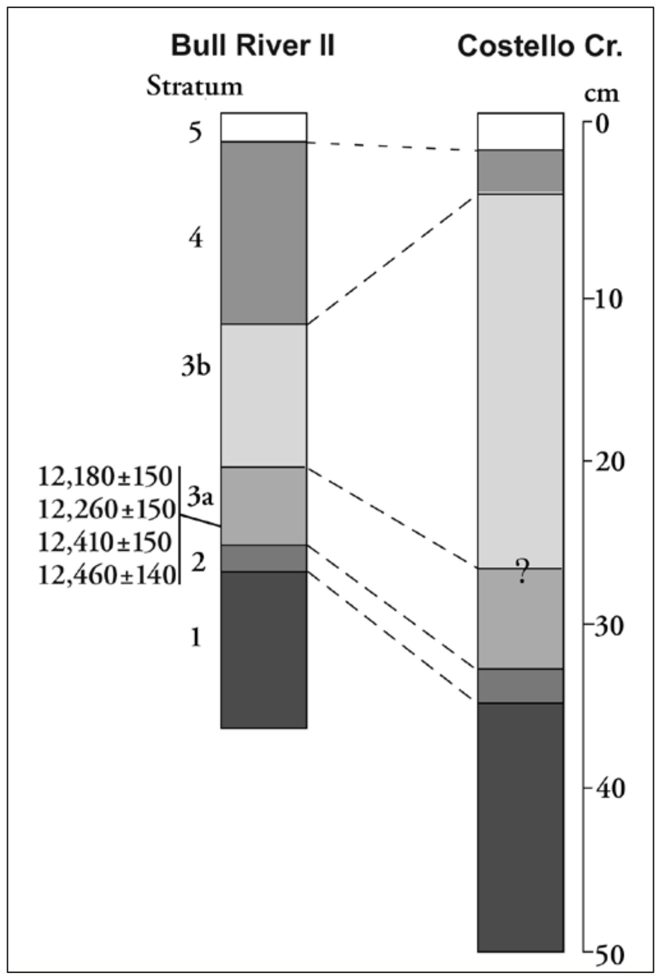


***Figure 4. Schematic stratigraphic comparison of the Bull River II and Costello Creek sites with calibrated radiocarbon data.***

As at Bull River II, the Costello Creek assemblage was deposited within stratum 3 with upward displacement of artifacts oriented vertically through cryoturbation. An artifact-filled krotovina began in stratum 4 and extended through stratum 3. Fig. 5 depicts a three-dimensional representation of a 1 x 1 m excavation unit and point provenienced artifacts. The krotovina is visible in the profile on the right and the corresponding displaced artifacts found within the unit matrix are depicted in the block diagram at the left. Despite these disturbances, careful documentation of the sediments and post-depositional disturbances distinguished displaced artifacts from those found *in situ*. Although the age of the Costello Creek site is currently unknown, the attributes and stratigraphic position of its lithic assemblages are comparable to those at Bull River II.

## ARTIFACT ASSEMBLAGES

A lithic analysis was designed to detect and compare flintknapping behaviors between the Bull River II and Costello Creek assemblages based on frequencies of raw material type, amount of dorsal cortex, platform preparation, and metric data (Wygal 2009). Tools are distinguished from flaked debris (except for those associated with primary reduction, i.e., cores and core fragments). Additional traits recorded on tools include edge angle, condition, and the following retouch characteristics: form, degree of invasiveness, location, and number of retouched margins. No blades, microblades, burins, or associated technology were found in the Bull River II or Costello Creek assemblages.

### BULL RIVER II

Flaked debris (n = 566) and tools (n = 13) were recovered from Bull River II. Raw material frequencies consist of blue-gray siltstone (88.9%), sandstone (6.6%), chert (2.8%), basalt (0.7%), claystone (0.7%), and chalcedony (0.3%). All tools in the assemblage are on siltstone. Raw material frequencies among flaked debris mirror the overall assemblage with siltstone as the principal type (88.7%) followed by lesser sandstone (6.7%), chert (2.8%), claystone (0.7%), basalt (0.7%), and chalcedony (0.4%).

All formal tools at Bull River II are biface fragments (N = 5) in various stages of production (stages 1, 2 to 4). Each biface possesses scalar retouch except a stage 2 biface, which is stepped. Biface retouch invasiveness ranges from 16.8 to 32.57 mm and edge angles vary between 25° to 38°. Nearly one in three tools has retouch on one edge (30.8%), but most (46.2%) have two worked edges. Late-stage bifaces are worked on three (15.5%) or four (7.7%) edges.

Informal tools (n = 8) include unretouched utilized flakes (23.1%), a *tci-tho* scraper (7.7%) and a notched flake (7.7%). The *tci-tho* cortical spall has stepped retouch on two lateral margins. Retouched flakes tend to be unifacially worked with marginal and scalar retouch forms. The notch measures 11.35 mm on the right lateral margin of a distal flake fragment that bears no other retouch. No hammer or anvil stones were recovered.

Tools and flake debris show a range of cortex preservation. The *tci-tho* scraper is the only tool with >90% dorsal cortex; an unhafted biface (stage 2) has 51–90% cortex and the remaining tools (84.6%) lack cortex (Fig.

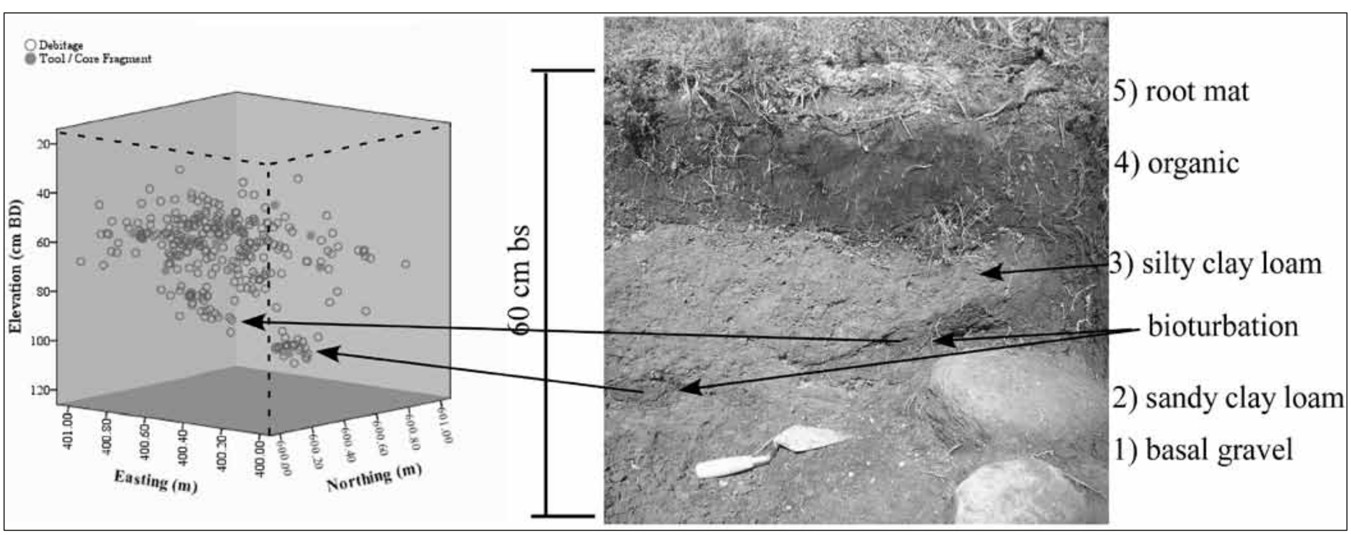


*Figure 5. Stratigraphic profile and block diagram from Costello Creek, highlighting artifacts displaced through upward through cryoturbation and downward through bioturbation.*

6). Among flaked debris, 75.8% lack cortex while 17.3% have greater than 90% cortex. The majority of tools from Bull River II are between 5 and 7 cm in size (92.3%) and one is 7 to 9 cm. Flaked debris ranges in size from >1 cm (3%), 1 to 3 cm (57.1%), 3 to 5 cm (28.3%), 5 to 7 cm (9.2%), 7 to 9 cm (1.6%), and 9 to 11 cm (0.9%).

Most tools are broken (61.5%) and lack an identifiable platform (53.8%). When platforms are present, most are simple (38.5%) followed by cortical platforms (7.7%). None of the platforms on tools are complex or crushed. On flaked debris, platform preparation includes simple (36.9%), complex (14.5%), cortical (7.1%), and unidentifiable (41.5%) varieties. Debitage type classifications include complete (29.2%) and fragmented flakes (35.5%) produced primarily from siltstone cobbles. Primary core reduction is represented by angular shatter (4.2%), primary and secondary cortical spalls (21%), and fragmented multidirectional flake cores (0.9%). When complete flakes are counted (n = 165), flaked debris associated with core reduction equals more than 55% of the debitage assemblage. Biface thinning flakes (7.4%) and retouch chips (1.1%) indicate biface production was common but more refined retouching activities were less frequent.

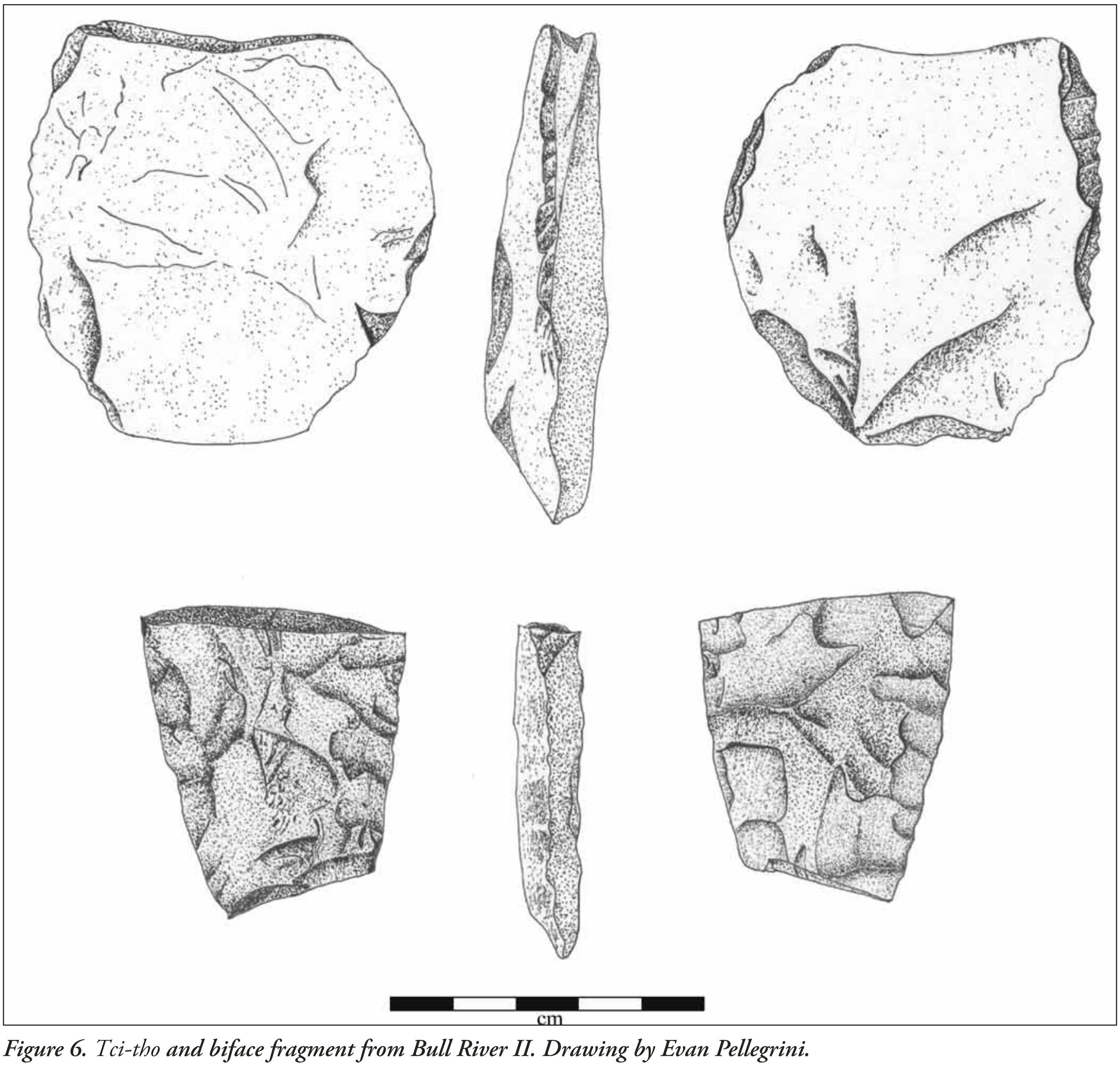


***Figure 6.*** *Tci-tho* ***and biface fragment from Bull River II. Drawing by Evan Pellegrini.***

### COSTELLO CREEK

The Costello Creek lithic assemblage contains 422 pieces of flaked debris and 4 tools. The assemblage is dominated by siltstone (91.8%), primarily a brown to tan variety, with lesser amounts of sandstone (5.2%), basalt (2.3%), and chert (0.7%). Because there are only four tools in the assemblage, raw material frequencies of flaked debris closely mirror the assemblage as a whole (Table 3): siltstone (92.2%), sandstone (5.2%), basalt (2.1%), and chert (0.5%).

The tool assemblage consists of a side scraper on brown siltstone with stepped retouch on the lateral margins, a retouched flake, also on brown siltstone, with marginal retouch, a notched flake on tan chert (notch size = 20.38 mm) with an edge angle of 44°, and an unretouched utilized flake on basalt. No hammer or anvil stones were recovered at Costello Creek. All tools were manufactured on flakes and only the notched flake was a complete specimen. These tools are considered informal because they were expediently manufactured and discarded in a single setting.

The only tool in the Costello Creek assemblage with dorsal cortex is the retouched flake with 51–90% surface coverage. Among flaked debris, 84.1% lack cortex and 11.6% posses greater than 90% dorsal cortex. Two tools are between 1 and 3 cm, and one is 3 to 5 cm, another is 5 to 7 cm. Flaked debris size classes range from <1 cm (1.7%), 1 to 3 cm (64.2%), 3 to 5 cm (25.1%), 5 to 7 cm (6.2%), 7 to 9 cm (2.1%), 9 to 11 cm (0.5%), and 11 to 13 cm (0.2%).

Simple platforms are preserved on two of the tools at Costello Creek and no platforms are preserved on the remaining tools. Platform preparation on flaked debris includes simple (34.2%), complex (15.4%), cortical (9.3%), and unidentifiable (32.5%) varieties. Debitage types include complete flakes (33.7%), fragmented flakes (33.3%), biface thinning flakes (13.3%), retouch chips, chip fragments (<1%), and a blade-like flake (0.5%). Detritus from primary reduction activities includes primary (10.9%) and secondary (3.1%) cortical spalls and angular shatter (4.2%). The frequency of debitage types suggests biface production was common at the site and more than half (51.9%) of flaked debris is consistent with core reduction activities.

## DISCUSSION

In both assemblages, raw material types are skewed in favor of siltstone (Table 2) and tools were recovered in frequencies too low for meaningful statistical analyses (Table 3).

*Table 2. Raw material frequencies at Bull River II and Costello Creek.*

| | Bull River II | | | | | | Costello Creek | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Debitage | | Tools | | Total | | Debitage | | Tools | | Total | |
| Raw Material | N | % | N | % | N | % | N | % | N | % | N | % |
| Basalt | 4 | 0.7 | — | — | 4 | 0.7 | 9 | 2.1 | 1 | 25 | 10 | 2.3 |
| Chalcedony | 2 | 0.4 | — | — | 2 | 0.3 | — | — | — | — | — | — |
| Chert | 16 | 2.8 | — | — | 16 | 2.8 | 2 | 0.5 | 1 | 25 | 3 | 0.7 |
| Sandstone | 38 | 6.7 | — | — | 38 | 6.6 | 22 | 5.2 | — | — | 22 | 5.2 |
| Siltstone | 502 | 88.7 | 13 | 100 | 515 | 88.9 | 389 | 92.2 | 2 | 50 | 391 | 91.8 |
| Claystone | 4 | 0.7 | — | — | 4 | 0.7 | — | — | — | — | — | — |
| Total | 566 | 100 | 13 | 100 | 579 | 100 | 422 | 100 | 4 | 100 | 426 | 100 |

*Table 3. Tool class frequencies at Bull River II and Costello Creek.*

| | Bull River II | | Costello Creek | | Total | |
|---|---|---|---|---|---|---|
| Tool Type | N | % | N | % | N | % |
| Biface unhafted | 5 | 38.5 | — | — | 5 | 29.4 |
| Flake tool | 3 | 23.1 | 1 | 25 | 4 | 23.5 |
| Retouched flake | 3 | 23.1 | 1 | 25 | 4 | 23.5 |
| Side Scraper | — | — | 1 | 25 | 1 | 5.9 |
| Tci-tho | 1 | 7.7 | — | — | 1 | 5.9 |
| Notch | 1 | 7.7 | 1 | 25 | 2 | 11.8 |
| Total | 13 | 100 | 4 | 100 | 17 | 100 |

Tools in common between the Bull River II and Costello Creek assemblages include expedient notched flakes and flake tools. While late-stage biface fragments dominate the Bull River II assemblage, no bifacial fragments were recovered at Costello Creek. However, the percentage of biface thinning flakes comprised more than 13% of that assemblage. These sites lack microblade technology and do not fit traditional Denali or Nenana complex designations (Goebel et al. 1991; Powers and Hoffecker 1989; West 1996).

Survey of the Camp Creek tributary directly between Bull River II and Costello Creek revealed an abundant supply of sedimentary rocks including siltstone, sandstone, and claystone. Blue-gray banded and brown to tan siltstone varieties comprise the bulk of raw material types in both site assemblages. Smaller amounts of chert, basalt, and chalcedony also occur among the flaked debris, are probably nonlocal in origin because these lithic types lack cortex, and were not observed in local tributaries. Chalcedony flakes recovered from Bull River II are similar in color and texture to artifacts from the Trapper Creek Overlook site in the Susitna River lowlands (Wygal 2009). While the source of this material is currently unknown, Coffman (2006) recovered a similar chalcedony cobble from natural deposits in Hurricane Gulch, an eastern tributary of the middle Chulitna River about 30 km south of Bull River II.

Obsidian artifacts were recovered at two nearby locations, HEA-232 and Camp Creek II (HEA-391), near the Bull River II site. Archaeologists at the Smithsonian Institution used X-ray fluorescence (XRF) to compare the chemical composition of the specimens to an extensive database of Alaska obsidian. The results were a "solid match" with Cook's (1995:97) group K obsidian, which has also been recovered from Dry Creek component II (R.J. Speakman pers. comm. 2007), suggesting the prehistoric occupants of Dry Creek component II procured obsidian from the same source as people in the Bull River valley.

Tools and degree of dorsal cortex are indicators of the relative distance an artifact has traveled from the procurement source. More dorsal cortex is expected for artifacts found nearer the source than those found farther away (Feder 1980; Newman 1994). This measure is amplified in high latitudes since procurement of lithic material is more difficult during winter months (Wygal 2009:88, 112). Tools at Bull River II range from 3 and 7 cm in maximum size and two tools possess more than 50% dorsal cortex. While Costello Creek produced few tools, most are between 3 and 5 cm with a slightly higher percentage of cortex than at Bull River II (Table 4). Given the size and degree of cortex on the tools from both sites, it is reasonable to assume the toolstone was procured nearby. This interpretation is also supported by the presence of locally available raw material in the assemblages.

Amount of dorsal cortex and measurements on flaked debris are also indicative of core reduction activities. A relatively high percentage of the debitage from Bull River II and Costello Creek (15% of the combined total of debitage from both sites) possessed more than 90% dorsal cortex (BR = 17.3%; CC = 11.6%). The percentage of flakes measuring 1 to 3 cm was also consistent between the two sites (BR = 51.7%; CC = 64.2%). Flakes between 3 and 5 cm are also prevalent (BR = 28.3%; CC = 25.1%) but debitage pieces less than 1 cm in size are relatively rare (BR = 3%; CC = 1.7%). These percentages are another good indication that raw material was worked near its procurement source.

Debitage type frequencies are remarkably similar between the sites with relatively high numbers of complete flakes and cortical spalls and low numbers of retouch chips

***Table 4. Artifact size class frequencies at Bull River II and Costello Creek.***

| | **Bull River II** | | | | | | **Costello Creek** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Debitage** | | **Tools** | | **Total** | | **Debitage** | | **Tools** | | **Total** | |
| **Size (cm)** | **N** | **%** | **N** | **%** | **N** | **%** | **N** | **%** | **N** | **%** | **N** | **%** |
| < 1 | 17 | 3.0 | — | — | 17 | 2.9 | 7 | 1.7 | — | — | 7 | 1.6 |
| 1–3 | 323 | 57.1 | — | — | 323 | 55.8 | 271 | 64.2 | 2 | 50 | 273 | 64.1 |
| 3–5 | 160 | 28.3 | — | — | 160 | 27.6 | 106 | 25.1 | 1 | 25 | 107 | 25.1 |
| 5–7 | 52 | 9.2 | 12 | 92.3 | 64 | 11.1 | 26 | 6.2 | 1 | 25 | 27 | 6.3 |
| 7–9 | 9 | 1.6 | 1 | 7.7 | 10 | 1.7 | 9 | 2.1 | — | — | 9 | 2.1 |
| 9–11 | 5 | 0.9 | — | — | 5 | 0.9 | 2 | 0.5 | — | — | 2 | 0.5 |
| 11–13 | — | — | — | — | — | — | 1 | 0.2 | — | — | 1 | 0.2 |
| Total | 566 | 100 | 13 | 100 | 579 | 100 | 422 | 100 | 4 | 100 | 426 | 100 |

and chip fragments (Table 5). Three or more flake scars, with the largest scars ranging from 23 to 68 mm, characterize multidirectional core fragments from both sites. Worked margins on cores varied from a single retouched margin to all margins with flake scars.

Among flaked debris, platform preparation is uniform between the assemblages, with simple platforms dominating. The relatively common occurrence of cortical platforms in both assemblages (BR = 7.1%; CC = 9.3%) is an indication of primary core reduction. Complex platforms, which typically occur on bifacial thinning flakes, are also common (BR = 14.5%; CC = 15.4%).

To better assess flaking behavior between the assemblages, I applied a series of intersite tests on a variety of lithic attributes. To compare reduction intensity, the Mann-Whitney statistic was used to determine if the mean ranks of flake size class frequencies were different between the Bull River II and Costello Creek assemblages. The results indicate that flake size classes are statistically equivalent between the assemblages ($u = 113330.50$, $a = -1.573$, $p = 0.116$, two-tailed). Reduction stage and intensity were examined further by categorizing each assemblage based on debitage weights. The weights of individual debitage pieces are an exact measure of flake mass and thus an indication of reduction stage because smaller mean weights of flaked debris represent smaller flake sizes (Odell 2004:126; Shott 1994:80). Statistical tests indicate that the mean weights of flaked debris at Bull River II and Costello Creek are statistically equivalent, suggesting that similar flake reduction behaviors occurred.

***Table 5. Flaked debris frequencies at Bull River II and Costello Creek.***

| Debitage Class | Bull River II | | Costello Creek | | Total | |
|---|---|---|---|---|---|---|
| | N | % | N | % | N | % |
| Flake fragment | 201 | 35.5 | 140 | 33.2 | 341 | 34.5 |
| Complete flake | 165 | 29.2 | 141 | 33.4 | 306 | 31.0 |
| Blade-like-flake | 2 | 0.4 | 2 | 0.5 | 4 | 0.4 |
| Prim. cortical spall | 94 | 16.6 | 46 | 10.9 | 140 | 14.2 |
| Sec. cortical spall | 25 | 4.4 | 13 | 3.1 | 38 | 3.8 |
| Retouch chip fragment | 2 | 0.4 | 1 | 0.2 | 3 | 0.3 |
| Retouch chip | 6 | 1.1 | 3 | 0.7 | 9 | 0.9 |
| Bifacial thinning flake | 42 | 7.4 | 56 | 13.3 | 98 | 9.9 |
| Angular shatter | 24 | 4.2 | 16 | 3.8 | 40 | 4.0 |
| Worked chert cobble | — | — | 1 | 0.2 | 1 | 0.1 |
| Core fragment | 5 | 0.9 | 3 | 0.7 | 8 | 0.8 |
| Total | 566 | 100 | 422 | 100 | 988 | 100 |

Because platform types are indicative of patterns in lithic reduction (e.g., percussion versus pressure flaking techniques), distinctions in flaking behaviors can be assessed by differences between platform type frequencies (Andrefsky 1998; Odell 2004). No significant differences in platform preparation between Bull River II and Costello Creek were detected using chi-square analysis.

The density of deposits and attribute analysis support the hypothesis that lithic reduction and biface production of locally available siltstone were the primary activities undertaken at the Bull River II and Costello Creek sites. Statistical tests indicate that stone knapping behaviors were similar between the two sites. If multiple palimpsest assemblages were deposited at these sites, then the activities undertaken during each occupation event were remarkably similar. Moreover, site locations are not particularly distinct, i.e., there are no unique topographical features on the landform. This is particularly evident along the 2-km ridge containing Bull River I, Bull River II, and the HEA-232 sites, where any single location is as ideal as the next, thereby limiting the probability of mixed assemblages.

The assemblages presented here were recovered from relatively small-scale test excavations, a 1-m$^2$ unit at Costello Creek and 3 m$^2$ at Bull River II. Some researchers have argued that sample sizes account for significant analytical problems (Rhode 1988). However, others (Mason et al. 2001:531) maintain that increasing an excavated area, even substantially, would not necessarily resolve sampling issues in assemblage variability.

### SEASONAL LAND USE AND TECHNOLOGICAL ORGANIZATION

The alpine setting of Bull River II and Costello Creek is in close proximity to ice patches and other upland resources. Assuming this region was unoccupied during harsh winter months leads to hypotheses *vis-à-vis* seasonal rounds and technological organization in the central Alaska Range between 12,500 and 8,000 cal BP. Many Late Pleistocene/early Holocene sites in the Nenana and Tanana River valleys occupy bluff-top overlook positions which Guthrie (1983) argued were logistical spike camps. However, the Healy Lake site diverges from this common pattern because it reportedly contained artifacts reminiscent of more than one lithic industry and multiple activities. Thus, Healy Lake was originally considered a substantial base camp rather than a hunting outpost (Cook 1996; Yesner 2001:319). Early to middle Holocene assemblages at

Whitmore Ridge and Butte Lake in southcentral Alaska are reminiscent of Healy Lake in that they contained both bifaces and extensive microblade production facilities and are represented by relatively high artifact frequencies near large lakes (Betts 1987; West et al. 1996). Dry Creek component II arguably fits this mold; although not along a lakeshore, it is near Eight Mile Lake and adjacent to an excellent raw material source in the Dry Creek riverbed. Dry Creek component II contained evidence of butchering, microblade core preparation, and bifacial projectile points within the assemblage (Hoffecker et al. 1996; Powers and Hoffecker 1989; Powers et al. 1983).

These site types may represent late fall to early winter occupations where remnants of fall hunting toolkits merge with activities associated with winter gear-up. Late fall to early winter would have been a rich season when hunter-gatherers could congregate, trade and visit prior to the lean late winter and early spring times when groups may have dispersed into smaller family units and hunted river lowlands to survive. A similar pattern has been observed among traditional Athapaskan groups in central and southcentral Alaska (Kari and Fall 2003). Although Athapaskan economies relied heavily on the seasonal abundance of salmon (a resource that likely did not materialize until the middle Holocene) and less on big game hunting from overlook positions, it is reasonable to assume hunter-gatherers practiced similar seasonal rounds during the Late Pleistocene and early Holocene (Wygal 2009). If they did, assemblage variability in conjunction with site setting could be a powerful indicator of technological organization. Future research at Bull River II and Costello Creek will be modeled to test this hypothesis.

## CONCLUSIONS

Survey and test excavations of Bull River II and Costello Creek in the mountains south of Broad Pass, Denali National Park and Preserve, revealed new evidence on the prehistoric occupation of upland areas in the central Alaska Range. These sites are significant because they provide evidence for the early prehistoric use of alpine resources, evidence that is currently underrepresented in the Alaska archaeological record. Although limited testing has been undertaken thus far, the relatively dense deposits have yielded sizable lithic assemblages. Lithic analyses indicate similarities between raw material selection and flaked debris, suggesting lithic reduction and biface production were the primary activities at both locations. Evidence of core reduction and biface manufacture was recovered, but evidence of microblade technologies was not found in any of the sites documented in this survey; the assemblages do not readily fit currently defined techno-complexes. An intact cultural horizon at Bull River II yielded carbon-rich stains associated with artifacts and clusters of charcoal. AMS radiocarbon dates on four fragments of charred plant remains date the occupation to between 12,500 and 12,300 cal BP. Because prehistoric foragers were likely highly mobile, these sites may represent a wider economic system based on the seasonal organization of technology and landuse.

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