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Lithic Technology at Linda's Point, Healy Lake, Alaska

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ABSTRACT. Interior Alaska's Healy Lake archaeological locality contains a cultural sequence spanning 13 500 years, beginning with some of the oldest known human occupations in Alaska. From 2011 to 2014, we conducted archaeological excavations at the Linda's Point site. Detailed recording has clearly separated the lowest cultural component at the site and begun to clarify the contentious culture history of the Healy Lake area. The lower component, associated with a thick paleosol, contains multiple hearths, debitage, and small triangular points similar to those seen at the Healy Lake Village site. The upper silt deposits contain a variety of lithic tool types within a dense scatter of debitage and bone fragments spanning a wide time range. Linda's Point appears to have been used as a habitation site throughout its history, changing from recurring short-term occupations in the terminal Pleistocene to more intensive site habitation and greater reliance on local lithic resources during the Holocene.

Key words: archaeology; early Alaskan prehistory; Tanana Athabascans; lithic technology; Chindadn; microblades; First Americans

RÉSUMÉ. La localité archéologique de Healy Lake, à l'intérieur de l'Alaska, renferme une séquence culturelle s'étendant sur 13 500 ans et commence avec certaines des occupations humaines les plus anciennes connues de l'Alaska. De 2011 à 2014, nous avons effectué des fouilles archéologiques au site de Linda's Point. Les enregistrements détaillés ont permis de séparer clairement la composante culturelle la plus profonde du site et de commencer à expliquer l'histoire litigieuse de la culture de la région de Healy Lake. La composante la plus profonde, associée à un paléosol épais, contient de nombreux âtres, débitages et petites pointes triangulaires semblables à ceux aperçus au site du village de Healy Lake. Les dépôts de limon supérieurs renferment une variété de types d'outils lithiques faisant partie d'un éparpillement dense de débitages et de fragments d'os s'échelonnant sur un vaste intervalle de temps. Linda's Point semble avoir été utilisé comme lieu d'habitation au fil de son histoire, passant d'occupations répétées et de courte durée pendant le Pléistocène récent à une habitation plus intensive du site et à une plus grande dépendance des ressources lithiques locales pendant l'Holocène.

Mots clés : archéologie; préhistoire primitive de l'Alaska; Tanana Athapascans; technologie lithique; Chindadn; lamelles; premiers Américains

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INTRODUCTION

The prehistory of interior Alaska is represented by numerous well-stratified sites concentrated along the major drainage basins of the Tanana and Nenana Valleys (Fig. 1), many of which are securely dated to the late Pleistocene and early Holocene (LPEH) (Potter, 2008c; Goebel and Buvit, 2011). With the exception of the unique early component at Swan Point (Holmes, 2011), the earliest occupations are approximately contemporaneous with Clovis, the earliest widespread and well-represented archaeological culture to have proliferated south of the continental ice sheets (Waters and Stafford, 2007). Intensive excavation, numerous site reports, and geological and paleoenvironmental studies published during the last two decades have broadened our understanding of early Beringian chronology (Potter, 2008c; Saleeby, 2010). This work is complemented by an emerging literature on Beringian lithic technological organization (Graf and Goebel, 2009; Goebel, 2011) and faunal subsistence (Yesner, 2007; Potter et al., 2014a), which stands in contrast to more traditional narratives based on typology and the question of a microblade/non-microblade dichotomy (Dumond, 2011; Goebel and Buvit, 2011). Discussion centers on two general technological forms: bifacial tools and composite osseous tools inset with tiny specialized flakes known as microblades (Elston and Brantingham, 2002; Wygal, 2011).

In the Nenana Valley, a fairly straightforward pattern exists beginning 13 300 cal BP. Basal occupations at the Dry Creek, Owl Ridge, Moose Creek, and Walker Road

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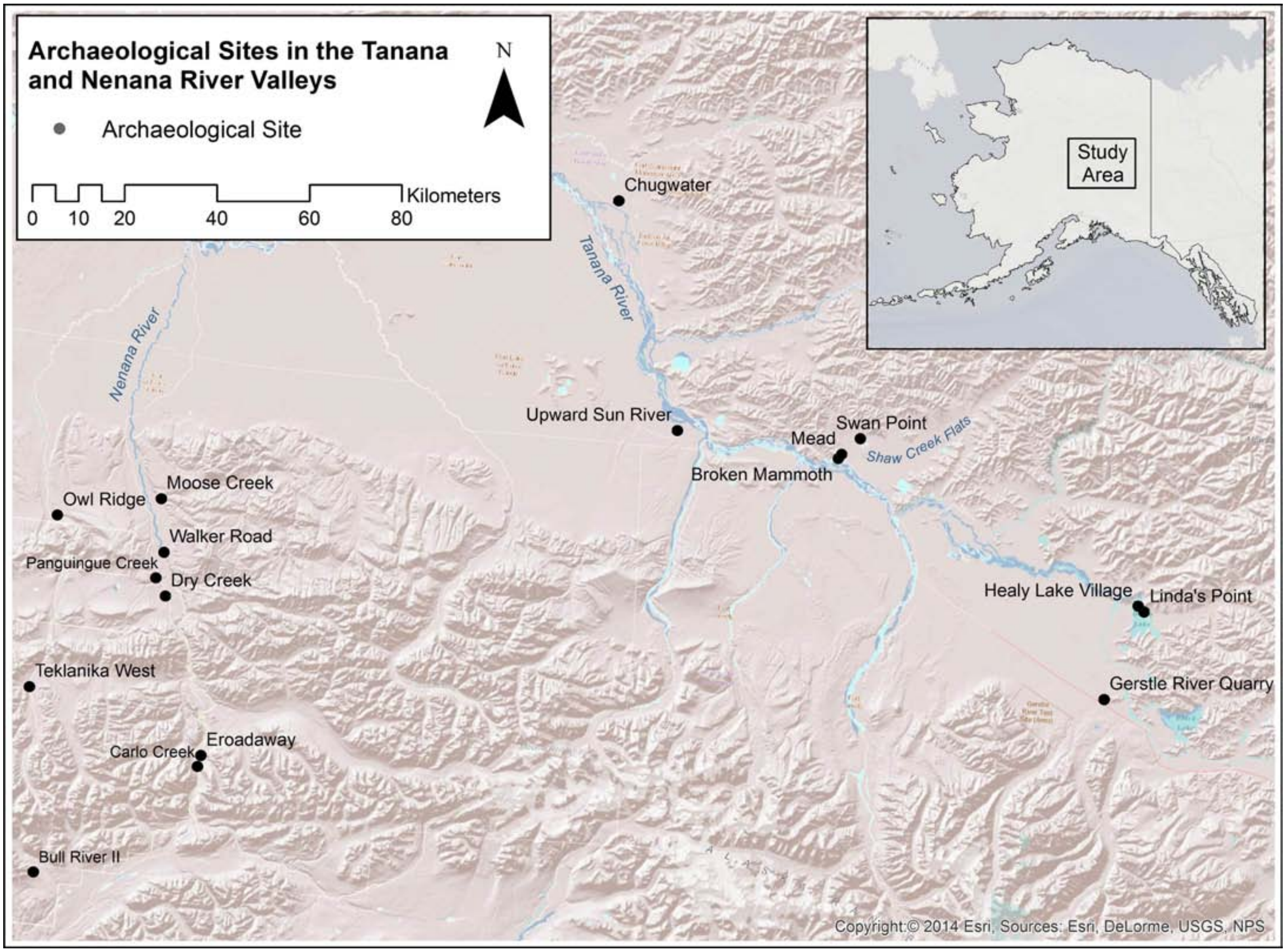

FIG. 1. Archaeological sites dating to the late Pleistocene and early Holocene in the valleys of the Tanana and Nenana Rivers.

sites have been assigned to the Nenana complex on the basis of the presence of blade tools, flake tools, gravers, and small, thin bifacial teardrop-shaped and triangular points (often called Chindadn points) and the consistent absence of microblade technology (Powers and Hamilton, 1978; Powers and Hoffecker, 1989; Hoffecker et al., 1993; Goebel et al., 1996; Pearson, 1999; Goebel, 2011; Gore and Graf, in press). After 12 750 cal BP, Chindadn points disappear, and core and blade technologies are replaced by those centered around microblades and wedge-shaped cores, lanceolate bifaces, and burins, which are assigned to the Denali complex (West, 1981; Powers and Hoffecker, 1989). These Denali technologies are found at Dry Creek (Component 2), Moose Creek (Component 2), Teklanika West, and Owl Ridge (Component 2) (Powers and Hamilton, 1978; Pearson, 1999; Coffman, 2011; Gore and Graf, in press). Similarly aged basal components at Carlo Creek and Panguingue Creek contain Denali-like assemblages, although they lack microblades (Bowers, 1980; Goebel and Bigelow, 1996; Bowers and Reuther, 2008). This toolkit persists throughout the Younger Dryas and early Holocene. Traditionally, the two complexes are interpreted as distinct cultural groups with different technological systems.

Tanana Valley cultural sequences are not so clearly separated. The earliest occupations at Swan Point date from 14 440 to 13 550 cal BP, representing the earliest known occupation of eastern Beringia, and they contain a microblade technology interpreted to be similar to Diuktai in Yakutia, Russia (Holmes et al., 1996; Holmes, 2011). After that period, the pattern of the Tanana record is similar to that seen in the Nenana Valley, with blades and small thin bifaces in early components. However, Chindadn-like points occur as late as 12 000 – 11 300 cal BP at Broken Mammoth and Swan Point and are potentially associated with microblade technology (Holmes, 1996, 2011; Krasinski, 2005; Potter, 2008b, 2011). These regional inconsistencies have led to the proposition that different technologies signify behaviorally adaptive strategies rather than stylistic or culturally normative choices (Wygal, 2011; Potter et al., 2014a). Different technological choices may represent variation in climate, seasonality, prey choice, raw-material availability, site use, or a combination of factors (Graf and Bigelow, 2011; Rasic,

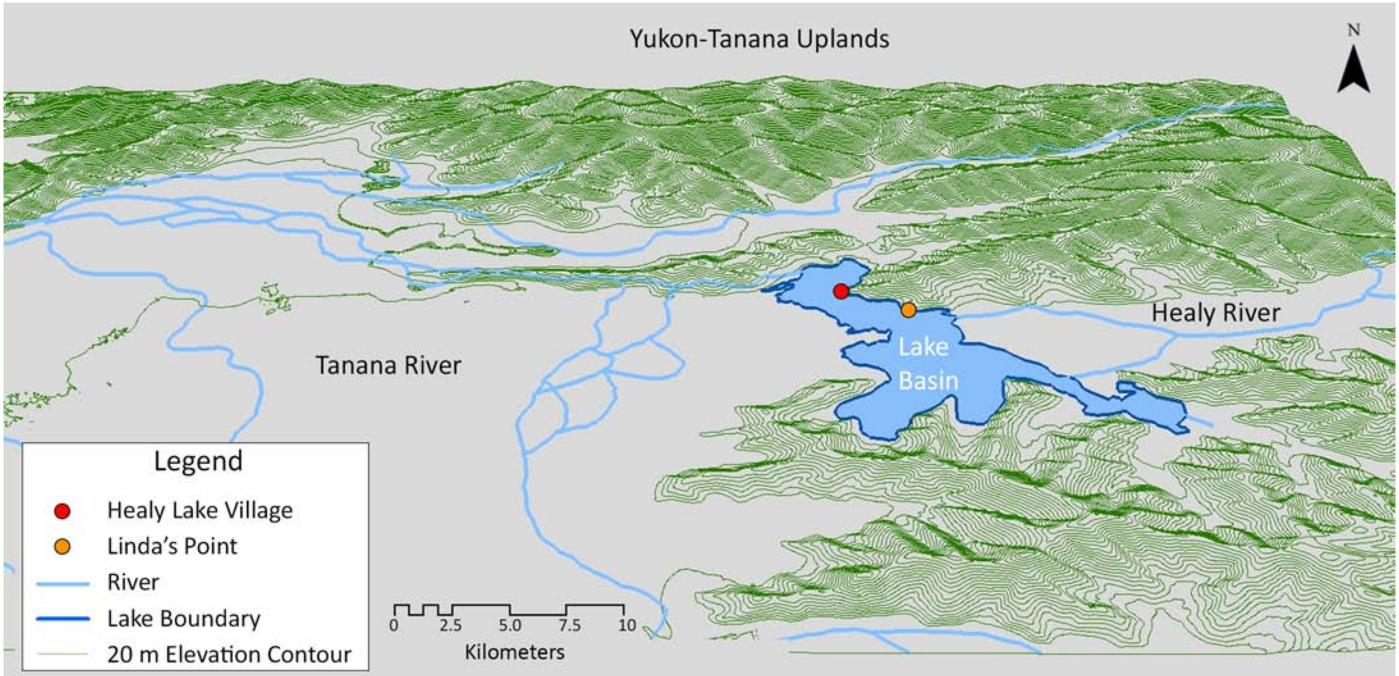

FIG. 2. Environmental context of the Healy Lake basin (by Christine A. Fik).

2011). However, despite local temporal differences within the Tanana basin, the overarching pattern remains the same: lanceolate bifaces are notably absent, and microblades and burins are rare prior to the Younger Dryas, after which both are found at Upward Sun River, Healy Lake, and Gerstle River, as well as farther south in the Tangle Lakes region (Cook, 1996; West, 1996; West et al., 1996; Potter, 2005; Graf and Bigelow, 2011; Potter et al., 2014b).

The Healy Lake Village site has been cited as a prime example of the coinciding presence of various technologies in the Tanana Valley during the LPEH (Holmes, 2001; Potter, 2008b). On the basis of 1967–72 excavation data, J. Cook grouped basally thinned triangular and teardrop-shaped points, lanceolate bifaces, microblades, wedge-shaped cores, and burins into the Chindadn complex, which he assigned to a single component dating from 13 500 to 9150 cal BP (Cook, 1969, 1996). It has since been questioned whether these materials truly represent a single cultural tradition or whether, instead, their apparent co-occurrence could be attributed to compressed stratigraphy, natural and cultural disturbances, and excavation methods (Dixon, 1985; Erlandson et al., 1991; Dilley, 1998:248; Hamilton and Goebel, 1999). Lack of detailed published information on the site has precluded clear answers.

From 2011 to 2014, as part of a series of studies aimed at clarifying the Healy Lake archaeological record, we conducted excavations at Linda's Point, an archaeological site located on the northern shore of Healy Lake only 1.8 km east of the Village site (Fig. 2). Here we report on our initial results, focusing on our preliminary research goals: summarizing the stratigraphy and cultural chronology of the site, with special focus on the lithic assemblages. On the basis of spatial and stratigraphic data, we first divide the assemblage into two major components: a lower suite of occupations dating to the late Allerød and Younger Dryas and upper occupations dating to the early Holocene. We then describe the lithic assemblage of each component. Finally, we discuss changes in lithic procurement and technological organization at the site through time, as well as in a regional context at Healy Lake and in the wider Alaskan interior. Two goals of future research that build on this work will be to focus on more detailed geochronological analysis and assessments of lithic technological organization.

LINDA'S POINT LOCAL ENVIRONMENT

Healy Lake is one of several water bodies impounded along the east margin of the Tanana River floodplain, where the broad fluvial lowlands intersect the bedrock escarpments of the Yukon-Tanana uplands (Fig. 2). The uplands are forested by birch (*Betula papyrifera*), spruce (*Picea glauca* and *P. mariana*), and aspen (*Populus tremuloides*), typical of boreal continental macroclimates. The lake is shallow, with a shoreline dotted by numerous islands, marshes, inlets, ponds, and wetlands where willow (*Salix* spp.) and shrub birch (*Betula glandulosa*) are dominant (Anderson, 1975). Today it presents an ideal residential setting, with nearby access to lake and wetland resources, upland hunting overlooks, and intermediary sheltered forests. At the lake outlet, the narrow Healy River snakes through silty overbank deposits and marshland into the Tanana River 2 km to the west, presenting a major transportation corridor.

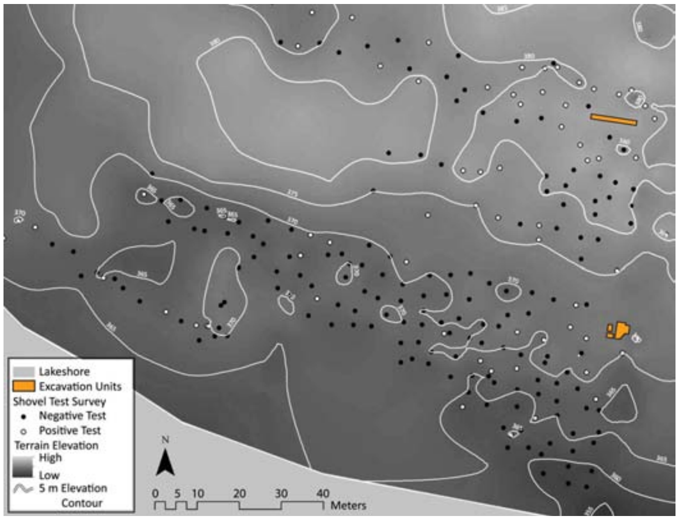

FIG. 3. Linda's Point shovel testing and excavation (by Christine A. Fik).

The Linda's Point site is located on a series of hillside terraces on a wide point of land on the northern lakeshore. Healy Lake is an open-basin system impounded against the foothills of the uplands by a low, natural levee of the Tanana River. The gradient between the lake and the river is slight, and during summer flood events drainage is frequently reversed, causing large volumes of silt-laden water from the Tanana to enter the lake. Over time, this process has resulted in the development of a complex delta (Reger et al., 2008:3). Lake levels in nearby closed-basin systems in the Tanana Valley fluctuated widely during the LPEH in response to changes in effective moisture (Abbott et al., 2000; Barber and Finney, 2000), but whether Healy Lake followed a similar history is difficult to evaluate because of differing basin geometries and uncertainty surrounding the timing of the Healy Lake impoundment. It may have been initiated by glacio-fluvial alluviation of the Tanana Valley during the last glacial maximum (Reuther, 2013:441), followed by decreased sediment input and local dissection during the late glacial (Péwé, 1977:38). However, the modern Tanana is an aggrading river system, and given the slight elevation of the modern levee, aggradation during Holocene flooding appears equally likely (Anderson, 1975; Mason and Begét, 1991).

During the time of earliest known human occupation of the region, Beringian landscapes were composed of arid steppe and tundra-like biomes, inhabited by grazing migratory megafauna and influenced by extreme, seasonally variable, and annually unpredictable climates (Bigelow and Powers, 2001; Guthrie, 2001; Hoffecker and Elias, 2007). Available resources and environmental challenges would have been quite different from those influencing ethnographic populations: unsheltered open vistas, predominance of large grazing herd animals, and limited small shrubby vegetation to provide woody materials for dwellings, sleds, basic tools, or fuel (Hoffecker, 2005). It is commonly hypothesized that early humans on the open Beringian landscapes were highly mobile, maintaining low population densities, high residential mobility, a heavy reliance on faunal resources, and seasonally determined patterns of landscape and resource use (Meltzer, 1995; Hazelwood and Steele, 2003; Kelly, 2003; Graf, 2010). In contrast, precontact and early-contact era Athabascans of the Tanana region followed patterns of logistical seasonal mobility, reflecting seasonal changes in resource availability. Family groups coalesced into larger bands at summer fishing villages and dispersed back into smaller foraging parties in the winter, when game became scarce (McKennan, 1959; VanStone, 1974; Helm, 1981). Potter (2008a) hypothesizes that this system of logistical mobility did not develop until increasing population densities and moderating environmental conditions of the Holocene favored semi-sedentary settlement patterns.

Site Excavation

First recorded in the 1960s by local resident Linda Kirsteatter, Linda's Point was tested provisionally in 2005 and systematically from 2010 to 2014 (Sattler et al., 2011). Testing of the middle terrace in 2010 produced ample concentrations of debitage and bone, flake tools, microblades, a lanceolate biface, and a deeply buried, intact hearth dating to 13 120–12 830 cal BP (Beta-293544). From 2011 to 2013, we excavated 12 1 × 1 m units to below the base of cultural deposits (Fig. 3), focusing on an area surrounding the hearth to ensure the recovery of early deposits within our sample area. Excavations produced a total of 6164 cultural items. Field methods included data recording of three-point provenience, angle of repose, and stratigraphic context of all artifacts found in situ. All sediments were screened by quadrant and 5 cm level through 1/8 inch mesh, with mapping and photography of each floor by unit and level. To maximize stratigraphic analysis, we preserved balks 0.5 to 1 m wide between excavation blocks. Shovel tests from the upper terrace have produced an obsidian scraper, obsidian microblade-production debitage, and a deeply buried small discoidal biface. Additional excavation is ongoing in this area, the results of which will be discussed separately upon completion.

Site Chronology

The cultural materials from Linda's Point are separable into two major components, each representing multiple occupations, and a third sparse component found within the modern soil. Artifacts were assigned to components according to their relationship to marker beds and soil horizons observed during excavation, discussed below, as well as through two- and three-dimensional plotting of artifact locations and the locations of refitted artifacts. Of 30 refits, 27 are among artifacts from the same component, while three reflect intrusive disturbance by a pit feature in the northwest area of the excavation. Further excavation of a wider sampling area may allow for identification of individual occupations within the two main components.

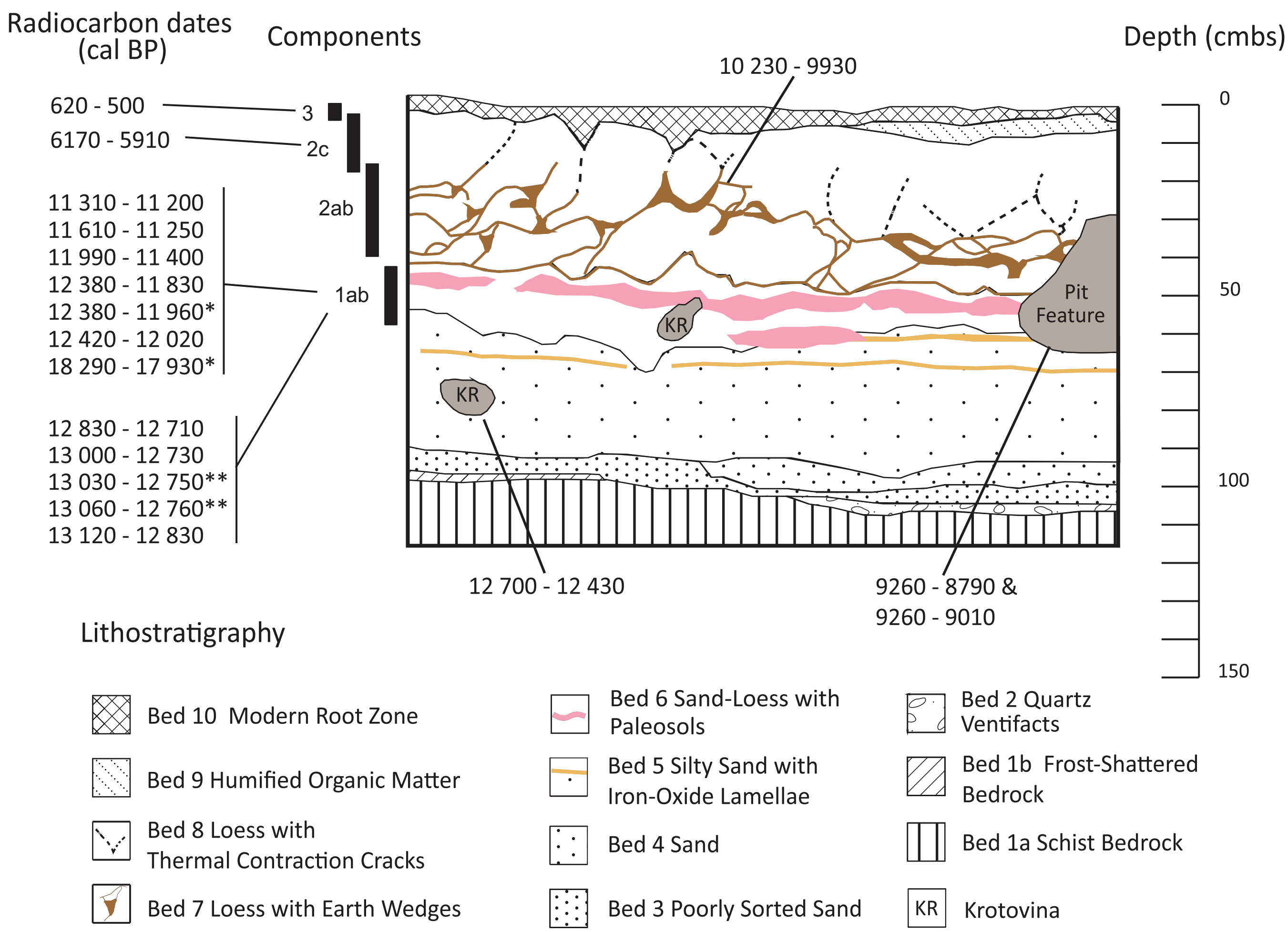

FIG. 4. Generalized stratigraphic profile at Linda's Point (split-sample dates noted by * and **).

Delineation of geoarchaeological strata was conducted by one of the authors (T.E. Gillispie), combining the assessment of site-formation processes and geochemical and micromorphological assessments of depositional activities, details of which will be reported separately. Briefly, 10 major sedimentary deposits are distinguishable, containing two major paleosols and reaching 130 cm in total depth (Fig. 4). The depositional sequence is similar to that seen at other sites in the Tanana Valley, most notably Swan Point (Hamilton and Goebel, 1999; Holmes, 2001, 2011; Reuther, 2013). Resting on schist bedrock (Bed 1A) and frost-shattered schist regolith (Bed 1b) is a lag deposit of quartz ventifacts (Bed 2). Above these is a series of late-glacial eolian sand deposits (Beds 3 through 5), totaling 40–60 cm thick. They are overlain by a series of loess deposits (Beds 6 through 8) totaling 50–70 cm thick. The lowest (Bed 6) is 15–20 cm of sand-loess containing two paleosols, lower PS1 and upper PS2. Fine loess above the paleosols contains two slightly overlapping zones of thermal contraction, each 15–30 cm thick. The upper zone (Bed 8) contains fine cracks of Holocene origin, while the lower zone (Bed 7) is assigned to the early Holocene, and contains a network of iron-clay lamellae and soil wedges, relicts of infilled thermal contraction cracks developed during seasonal permafrost freeze-thaw cycles (French, 2007). Finally, the top 5–10 cm of the section contain a weakly developed A horizon composed of organic silt (Bed 9) overlain by a thin organic horizon of roots and leaf litter (Bed 10).

The earliest cultural occupation is represented by a horizon of lithic artifacts, bone fragments, manuports, and four closely spaced features (Fig. 5). This assemblage is assigned to Component 1 (C1), found either resting on the PS2 surface, or impressed into the underlying silt-loess. Artifacts from C1 are mainly oriented horizontally, with an average maximum resting angle of 25.3° from the horizontal, which indicates minimal post-depositional disruption. Two hearths are represented by reddened soil, fire-cracked rock, and high concentrations of burnt and calcined bone. A third is visible as charcoal, heat-reddened quartz, and reddened soil. A fourth feature of unknown function is visible as an area of disrupted paleosol in the north wall of the excavation block, with associated stones, artifacts, and a light scatter of charcoal. Preliminary identification of bone fragments indicates the presence of vertebrae and longbone shaft fragments from large mammals.

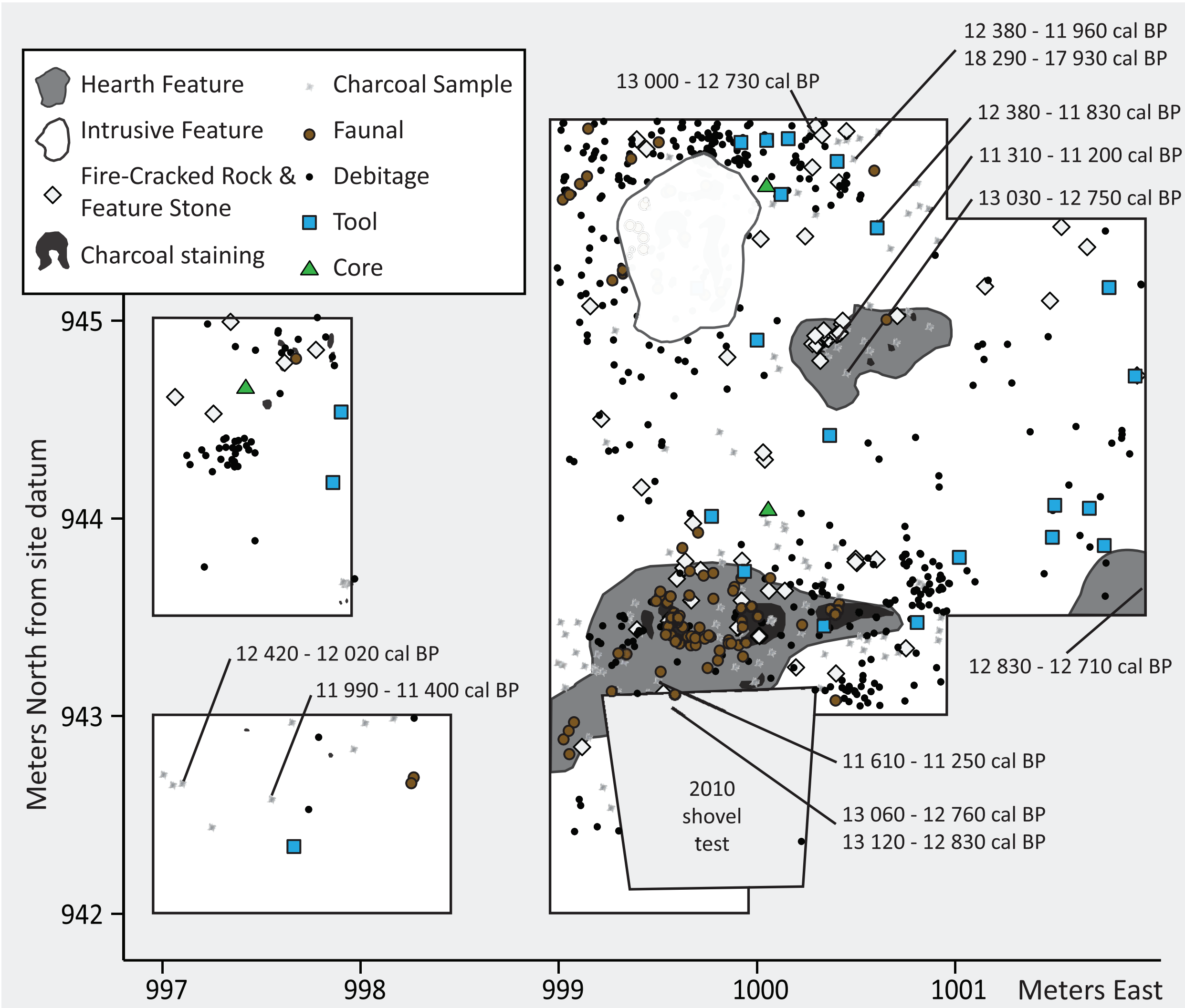

FIG. 5. Artifact and feature distributions within C1.

Eleven charcoal samples (including two split samples) from C1 hearths and dispersed contexts have provided 13 dates ranging from 18 200 to 11 200 cal BP (Table 1). Eleven of these dates fall between 13 100 and 11 200 cal BP and likely represent the age of C1. Of the remaining two, one is a small sample of *Salix* charcoal collected from the stone feature near the northern wall (Beta-378556) that yielded an aberrant date of 18 290 – 17 930 cal BP, which we reject because a split from this sample (UGAMS-18995) provides a stratigraphically consistent result of 12 380 – 11 960 cal BP. The discordant date is potentially attributed to laboratory error or anomaly, while the consistent date of the split supports acceptance of the sample within the site chronology. A twelfth date (Beta-343988), collected from below C1 in mid-Bed 5, yielded a discordantly late date of 12 700 – 12 430 cal BP. Subsequent excavation revealed the sample location to be an infilled, charcoal-containing rodent burrow; our interpretation is that the sample was likely displaced from the overlying C1 and therefore the sample and date should be rejected. The 10 accepted samples show a range of ages indicating a palimpsest of terminal Pleistocene occupations with re-use of hearths and surrounding activity areas. Temporal clustering suggests that C1 may be divided into two main occupation intervals: one dating from 13 100 to 12 700 cal BP and another from 12 400 to 11 200 cal BP. While the artifacts themselves cannot be divided into separate occupations, further excavation may isolate activity areas, allowing a partial separation.

Above the paleosols, a 10 – 15 cm layer of culturally sterile loess separates C1 from a younger series of occupations. Component 2 (C2), a dense cloud of bone and lithic artifacts within stratigraphic Beds 7 and 8, seems to represent multiple palimpsest occupations dating into the Holocene. Bone fragments are scattered throughout the upper deposits rather than concentrated in features, with a few items identified preliminarily as small mammal. Dispersed charcoal dating to the early Holocene (10 230 – 9930 cal BP, Beta-314661) was found stratigraphically near the transition between beds 7 and 8, in close association with large fragments of quartz debitage from the middle-lower portion of the C2 artifact cloud. The C2 component is also represented by a pit feature containing a fill of silt, flakes, and

TABLE 1. Radiocarbon dates from the Linda's Point site.

Laboratory ID No.	Component	Stratum	Charcoal ID	Conventional radiocarbon age	δ[13]C	2σ date (cal BP)[1]
Beta-343989	3	Bed 9 hearth feature		510 ± 30	−24.8	620 – 610; 550 – 500
Beta-395435	2	Bed 8		5220 ± 30	−24.5	6170 – 6160; 6100 – 6080; 6010 – 5910
Beta-361630	2	intrusive feature 5	*Salix* sp.	8110 ± 50	−25.4	9260 – 8980; 8910 – 8900; 8880 – 8870; 8830 – 8790
Beta-361631	2	intrusive feature 5	*Salix* sp.	8160 ± 50	−24.4	9260 – 9010
Beta-314661	2	Bed 7/8 contact		8970 ± 40	−26.8	10 230 – 10 120; 10 070 – 9930
Beta-378554	1	Bed 6 feature 2	*Salix* sp.	9840 ± 40	−25.9	11 310 – 11 200
Beta-378555	1	PS2, Bed 6 feature 1		9960 ± 40	−25.0	11 610 – 11 520; 11 500 – 11 250
Beta-372906	1	Bed 6		10 110 ± 60	−25.6	11 990 – 11 400
Beta-343986	1	Bed 6		10 290 ± 40	−24.3	12 380 – 12 330; 12 310 – 12 270; 12 240 – 11 940; 11 890 – 11 830
UGAMS-18995[2]	1	Bed 6 feature 4		10 310 ± 30	−25.2	12 380 – 12 340; 12 300 – 12 280; 12 240 – 11 960
Beta-378556[2]	1	Bed 6 feature 4	*Salix* sp.	14 900 ± 50	−24.5	18 290 – 17 930
Beta-372905	1	Bed 6	*Salix* sp.	10 370 ± 50	−26.2	12 420 – 12 020
Beta-343988	-	Bed 5 *krotovina*[3]		10 600 ± 50	−23.3	12 700 – 12 520; 12 490 – 12 430
UGAMS-18996	1	Bed 6 feature 3		10 930 ± 30	−25.8	12 830 – 12 710
Beta-372911	1	PS2, Bed 6 feature 4	*Salix* sp.	10 990 ± 50	−23.5	13 000 – 12 730
Beta-343987	1	Bed 6 feature 2		11 030 ± 50	−23.8	13 030 – 12 750
Beta-293543[2]		Bed 6 feature 1		11 050 ± 60	−25.2	13 060 – 12 760
Beta-293544[2]	1	Bed 6 feature 1		11 150 ± 60	−24.8	13 120 – 12 830

[1] Calibrated with CALIB v 7.0.2 using the IntCal 13 calibration curve (Reimer et al., 2013).

[2] Split sample.

[3] *Krotovina* is a filled-in animal burrow.

high concentrations of well-preserved wood charcoal dating to around 9200 cal BP. The pit originates near the base of Bed 8 and extends into Bed 5. Artifacts from within the fill were refitted to artifacts from undisturbed sediments of both C1 and C2, indicating that the intrusive feature was dug into the lower deposits and then filled in with a mixture of old and new deposits. Finally, a dispersed charcoal sample from near the top of the artifact cloud within Bed 8 dates to around 6100 cal BP. This information suggests that C2 likely includes a wide range, from 10 200 to 5900 cal BP.

Charcoal from a hearth feature in the wall just below Bed 10 dates to approximately 550 cal BP, representing a potential Component 3; however, because of the sparseness of artifacts just below the organic horizon, this component was not included in our analysis.

Piece-plotted artifacts were assigned to each component on the basis of their direct spatial and stratigraphic location, while screened artifacts were assigned to a component according to the stratigraphic associations of the quadrant and level from which they were excavated. Ambiguous stratigraphic contexts, such as rodent burrows, the pit feature, and quadrants containing multiple potential stratigraphic associations, were not ascribed to a component (NA), and their artifacts were omitted from analysis.

RESEARCH METHODS

One of the authors (A.M. Younie) conducted lithic analysis of the excavated assemblage from Linda's Point. Lithic materials were divided into tools and debitage, with marginally modified flakes assessed in both categories. Formal tools were photographed, classified, and described following standard methods. Bifaces were classified as hafted versus unhafted, with descriptions for outline, flaking, abrasion, fracture patterns, and reduction stage following Andrefsky (2005). Flake tools were classified by the characteristics of the working edge, and described by outline, retouch type and location, and fracture patterns, again following Andrefsky. Microblade tools and debitage are described collectively to evaluate the full microblade reduction sequence.

Complete and proximal debitage was classified by type mainly on the basis of platform characteristics, with additional information according to shape, size, and dorsal flake-scar characteristics following standard technological analysis (Andrefsky, 2005:120 – 127). Simple core-reduction flakes were identified as having non-acute platform angles, wide bodies, and wide or crushed platforms, with more robust percussion bulbs, ripple marks, éraillure scars, and hinged, stepped, or broken terminations. Retouch flakes included pieces resulting from thinning and trimming retouch. Flakes with acute angles, feathered terminations, and lipped platforms were classified as thinning flakes, and smaller items with narrow pressure-flaked platforms as trimming flakes. Trimming flakes were further distinguished as unifacial, with single-faceted platforms and sharp curvature, or bifacial, with multifaceted platforms and lower curvature (Andrefsky, 2005). To provide accurate minimum flake counts, complete pieces and proximal fragments were assessed collectively as "proximal flakes," while distal and medial fragments were grouped as unidentifiable flake fragments. All debitage was assigned to size classes, in 1 cm increments, on the basis of maximum dimension. For the purposes of our discussion, primary-reduction debitage includes those pieces relating to

TABLE 2. Cultural materials from Linda's Point by component.

Artifact types	Lower (C1)	Upper (C2)	Recent (C3)	NA[1]	Total
Debitage	1140	3394	25	296	4855
Faunal remains	456	488	2	77	1023
Fire-cracked rock	106	13	1	4	124
Flake tool	9	25	0	2	36
Microblade	0	34	0	2	36
Retouched flake	9	18	0	0	27
Biface	8	17	0	0	25
Core	3	16	0	1	20
Feature stone	13	1	0	1	15
Cobble	1	1	0	0	2
Floral remains	0	1	0	0	1
Total	1745	4008	28	383	6164

[1] NA = not assigned.

TABLE 3. Toolstone types from Linda's Point.

Lithic material	Lower (C1)	Upper (C2)	Recent (C3)	NA[1]	Total
Quartz	130	1421	16	116	1683
Rhyolite	161	860	3	53	1077
Chert	389	491	2	52	934
Chalcedony	289	452	0	35	776
Argillite	116	63	2	29	210
Basalt	84	34	0	3	121
Obsidian	1	86	1	5	93
Other	6	55	0	4	65
MCS	14	22	1	6	43
Quartz crystal	2	24	0	0	26
Total	1192	3508	25	303	5028

[1] NA = not assigned.

core reduction and flake production, including cores, cortical spalls, simple flakes, and shatter. Secondary-reduction debitage includes those pieces relating to tool shaping and edge working, including unifacial and bifacial thinning and trimming flakes, burin spalls, and other specialized flakes.

Toolstone types were classified through visual examination of grain size, luster, and color under 15× magnification. To identify geographic sources for obsidian and rhyolite and to differentiate ambiguous materials, we conducted pXRF analysis of geochemistry using a Bruker Tracer III-V at the University of Alaska Museum of the North, following methods described by Phillips and Speakman (2009). We assessed all obsidian pieces over 1 cm in diameter, as well as a sample of cortical and non-cortical rhyolite tools and debitage. Obsidian sources were assigned with reference to the Alaska Obsidian Database (Reuther et al., 2011), and rhyolite sources, with reference to work by Coffman and Rasic (2015).

LITHIC ASSEMBLAGES

Lithic tools and debitage make up the majority of the Linda's Point archaeological materials (Table 2), followed by mainly small, fragmentary faunal remains, and finally by larger pieces of fire-cracked rock (FCR), unmodified cobbles, and blocks of schist and quartz bedrock manuports used in hearths or other features. Overall, the upper and lower components share basic similarities, such as high proportions of debitage and low numbers of cores and tools. C1 differs distinctly in the relatively high frequency of schist and quartz feature stones, which reflects a high density of hearth features.

Raw Materials

The Linda's Point assemblage exhibits a diversity of lithic materials, with 10 raw-material classes represented (Table 3). Most are a variety of cryptocrystalline silicates, divided into fibrous chalcedony, granular cherts, and microcrystalline silicates (MCS), distinguished by coarser grains visible under a hand lens. Macro-crystalline quartz is common as quartz cobbles and ventifacts, as well as a few rare quartz crystal and quartzite artifacts. Igneous materials present at the site include mainly rhyolites and basalts, some obsidian, and a few coarser andesites classified under "other."

Local lake beaches, streams, and rivers are sandy, with few cobbles or pebbles available other than quartz and schist bedrock. Quartz is locally present as marginally knappable blocks of irregular crystal size, found in bedrock outcrops along the shores of the lake, and as ventifacted cobbles at the base of the soil profile. There is a

TABLE 4. Artifacts assigned to lithic source groups at Linda's Point.

Source group	Lower (C1)	Upper (C2)	NA[1]	Total
Obsidian:				
A (Wiki Peak)	0	7	0	7
B (Batza Tena)	0	15	0	15
unknown	1	0	0	1
Rhyolite:				
A	1	14	4	19
B	0	13	0	13
E	3	0	0	3
F	3	1	0	4
H	0	2	0	2
Total	8	52	4	64

[1] NA = not assigned.

TABLE 5. Tools found at Linda's Point.

Tool type	Lower (C1)	Upper (C2)	Total
Biface tool:			
Unfinished biface fragment	3	10	13
Unhafted biface	1	4	5
Hafted biface	4	3	7
Flake tool:			
Unknown	0	8	8
Combination tool	2	5	6
Side and end scraper	0	4	4
End scraper	2	2	4
Scraper	1	0	3
Intensively retouched flake	3	1	3
Side scraper	0	2	2
Burin	0	2	2
Notch	1	0	2
Knife	0	1	1
Total	17	42	60

distinct difference between the two components in the use of this local toolstone: quartz makes up only 11% of the C1 lithic assemblage, compared to 41% in C2. Quartz crystal is reported by local residents to have been collected in the uplands north of the lake.

Obsidian in C2 is sourced to Wiki Peak and Batza Tena (Table 4), two of the most common sources in the region, located more than 300 km from the site to the southeast and to the northwest, respectively (Cook, 1995; Reuther et al., 2011). C1 contains a single piece of obsidian, a concave-based projectile point (Fig. 6a). It closely matches the rare obsidian group CC, currently known to include this artifact and 10 pieces from the Trapper Creek Overlook site in the Susitna Valley of southcentral Alaska: five pieces from the early Holocene component I, and five from the middle Holocene component II, including a microblade (Wygal and Goebel, 2012; Rasic, 2015).

Five major rhyolite source groups are represented at Linda's Point (Table 4). Although their exact origins are still unknown, they also occur at the Village site (S. Coffman, pers. comm. 2014). At Linda's Point, C1 is characterized by groups E and F, while C2 rhyolite derives mainly from the more widespread A and B groups. The rhyolite groups are not identifiable by color; artifacts with color mottling and refitted pieces of varied colors suggest that color differences are more likely related to internal variations, soil staining, weathering, or heat treatment.

Component 1

Component 1 displays fairly even counts of bifaces and flake tools (Table 5), with a heavy emphasis on cherts and chalcedonies in the debitage and an even greater emphasis on chalcedony used for formal tools (Table 6).

Bifacial Tools: C1 contains four complete bifaces and four biface fragments. These include two finished hafted bifaces and two bases, a nearly complete mid-stage preform refitted from two fragments, a complete crescentic biface, and an unfinished edge fragment (Fig. 6). With the exception of the latter two items, all are consistent with the central Alaskan Chindadn biface type.

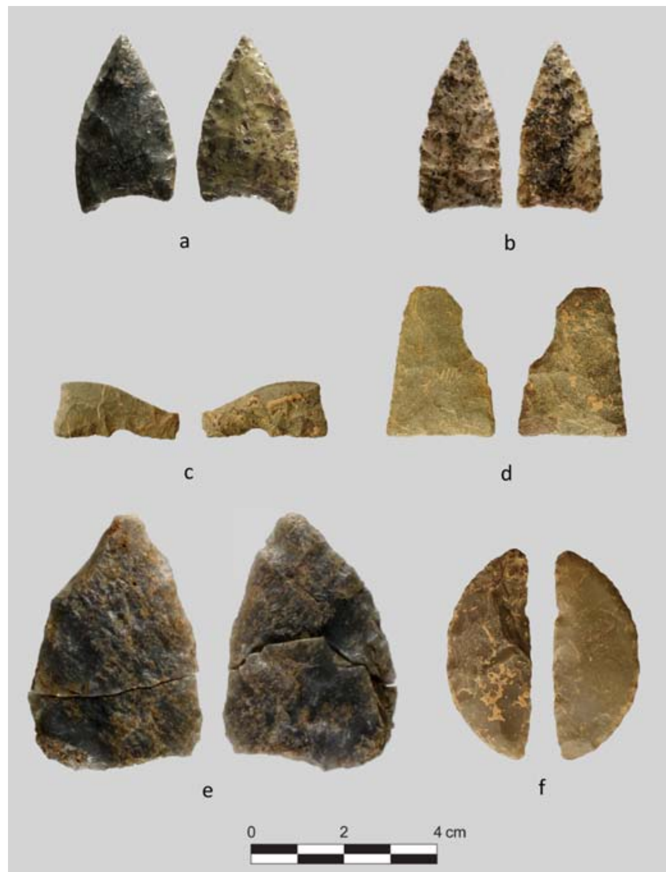

FIG. 6. C1 bifaces: a, b, complete triangular points; c, d, basal fragments of triangular points; e, refitted unfinished biface; f, crescentic biface.

A complete subtriangular, concave-based point of opaque green-brown obsidian (Fig. 6a) is the most striking of the bifaces. It is extensively worked, with finely feathered and stepped straight and oblique parallel flaking, as well as light edge-grinding and abrasion along the basal and proximal lateral margins. Parallel basal thinning flakes extend from both faces of the basal margin, obscuring prior thinning flakes on the proximal half of the point. The margins are smoothly convex and symmetrical, while one corner

TABLE 6. Linda's Point debitage and tools by material type.

Flake type	Argillite		Basalt		Chert		Chalcedony		MCS		Obsidian		Other		Quartz		Quartz crystal		Rhyolite		Total	
	C1	C2	C1	C2	C1	C2	C1	C2	C1	C2	C1	C2	C1	C2	C1	C2	C1	C2	C1	C2	C1	C2
Proximal flake:																						
Retouch flake	53	21	25	13	133	177	105	161	3	14		47	1	10	5	70			64	251	389	764
Simple flake	3	3	6	1	10	32	7	14	2	1		7		8	14	167		3	9	93	51	329
Bipolar flake															1	14		1			1	15
Cortical spall						2									8	4				1	8	7
Technical spall						4										1				1	0	6
Core rejuvenation flake						1														1	0	2
Flake fragment:																						
Flake fragment	56	38	51	19	224	218	166	266	9	6		30	4	36	53	635	2	14	84	480	649	1742
Shatter			1		13	7	1	1							23	498		5	2	13	40	524
Potlid					1	1										3			1	2	2	6
Microblade:																						
Microblade		1				24		3		1										1	0	30
Microblade core						1		1													0	2
Technical spall						1															0	1
Cobble														1	1						1	1
Core						2									3	10		1		3	3	16
Marginally retouched flake	2				5	5	2					2				9				2	9	18
Formal tool	2		1		2	16	8	6			1				2	8			1	12	17	42
Total	116	63	84	33	388	491	289	452	14	22	1	86	5	55	110	1419	2	24	161	860	1170	3505

of the base is longer than the other, potentially indicating reworking of a broken corner. As discussed above, its geochemical signature is rare for Alaska.

The second complete biface (Fig. 6b) is very thin, triangular in outline, and lenticular in cross-section, extensively but irregularly flaked on Group A rhyolite. Lateral margins are slightly convex and asymmetrical. Edge grinding is present along the margins and obscured by light abrasion near the proximal end.

Two straight-based fragments of green argillite were found at the same elevation but horizontally about 1 m apart. Their basal-corner angles are slightly acute, indicating they are likely fragments of triangular points. Both exhibit short, narrow, feathered basal-thinning scars. The shorter fragment (Fig. 6c) is broken just above the base in a rolling snap fracture, and it has a shallow notch on the basal margin created by a smaller fracture. The larger fragment (Fig. 6d) exhibits fine, shallow, straight parallel flaking and straight, regular margins, with light hafting abrasion near the base. The distal end is unusually thick and has been fully reworked, obscuring any previous breakage with a steep, concave scraping edge.

The refitted biface (Fig. 6e) is on a semi-translucent, pitted and irregular gray chalcedony that appears to have broken during manufacture. The two pieces were found at the same elevation, approximately 40 cm apart horizontally, and conjoin at a heavy rolling hinge off the stepped termination of a few wide thinning flake scars. Another fragment of the same material (Fig. 7i) was found 2 m away at a similar depth below the surface. It is small, with minimal flaking, and appears to have been broken along an incipient flaw in the material.

The final biface (Fig. 6f) is a bi-marginally retouched tool on a thin gray chert flake, semi-circular and crescentic in outline. The reduction approach is similar to that seen on many teardrop-shaped Chindadn points: marginal and unpatterned, with a few remnant dorsal scars and stepped thinning flakes that do not cross the entire artifact. A small patch of stream-rolled cobble cortex is visible on the dorsal face; however, the artifact has been sufficiently reduced to completely obscure the original flake platform. No edge-grinding or abrasion is visible on the margins, but there is light stepped use wear towards the center of the convex edge.

Flake Tools: C1 flake tools (n = 9) are mainly small, fairly informal fragments of scrapers and heavily edge-retouched flakes (Table 5). Of the three complete items, the largest is a thick basalt side scraper on a robust flake (Fig. 7j). It appears to have been heavily used so that the ventral face was abraded smooth along the working edge; this abrasion is accompanied by a few macroscopically visible striations perpendicular to the working edge. Two smaller end scrapers, one of chalcedony (Fig. 7g) and the other of chert (Fig. 7h), exhibit steep unifacial retouch and heavy use wear, as well as moderate to light shaping of the lateral margins.

The remaining flake tools are more expedient, on the border between formal tools and marginally retouched

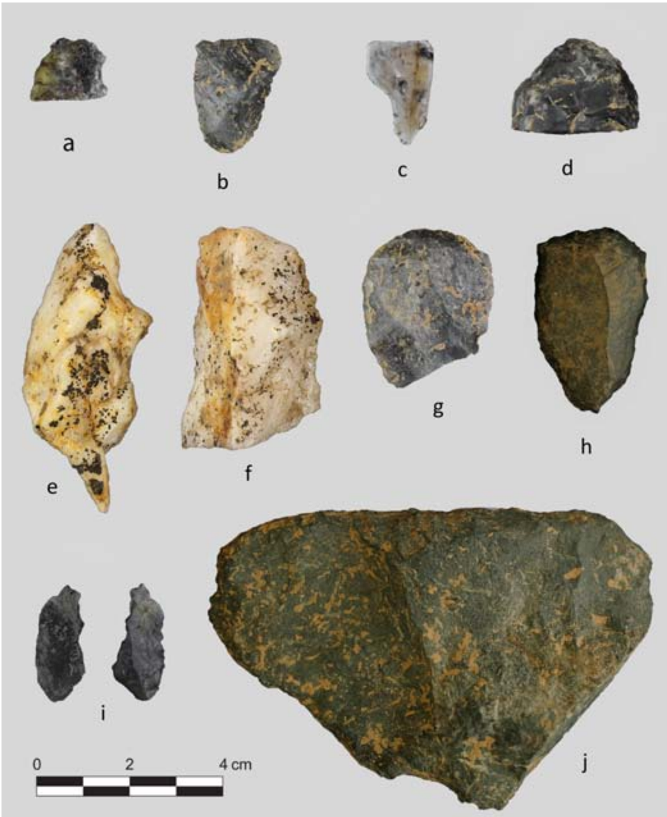

FIG. 7. C1 flake tools and biface fragment: a, c, combination tools; b, d, f, heavily retouched flakes; e, notch; g, h, end scrapers; i, biface edge fragment; j, large basalt scraper.

flakes. The largest are two robust quartz tools on thick blocky flakes; they are steeply retouched with extensive use damage on both lateral margins. One (Fig. 7f) exhibits yellowed cortex, while the other (Fig. 7e) exhibits a wide, steep notch near the distal end. Of the smaller tools, only one (Fig. 7b) is complete, a small triangular flake on gray chalcedony, with distal flaking to create a straight, shallow scraping edge (Fig. 7b). A second retouched flake (Fig. 7d) is on a cortical spall of dark gray chert, exhibiting patches of stream-rolled cobble cortex and steep use wear on both margins, terminating in step fractures along natural fracture planes in the dorsal cortex. The tool exhibits light use wear and is broken, apparently through heavy bipolar impact. The final two items, both on small delicate flakes of toolstone rare to the collection, are classified as combination tools because of the presence of multiple working edges. One (Fig. 7a) is a notched graving tool on a distal flake fragment of cream-colored chert, with two small spurs, one at the snapped edge and the other on the other end of the notch. The second item (Fig. 7c) is clear chalcedony and also exhibits retouch on a snapped edge, with use damage on the proximal and distal broken corners. Along with the formal tools are found an equal number of marginally retouched flakes of a variety of materials, most of which are fragmentary (Table 6).

Debitage: The C1 debitage assemblage contains 1152 items and is dominated in numbers by flake fragments and secondary retouch flakes of chert and chalcedony (Table 6). By weight, the assemblage is represented mainly by quartz and marginally also by chert (Table 7). Although shatter, cores, cortical spalls, a single cobble, and single bipolar flake are present, they make up only 4.7% of the debitage, and the majority of these items (63%) are quartz. Simple flakes make up another 4.4% and are dominated by quartz, chert, and chalcedony. Overall, the debitage is extremely small. Removing the cores and cobbles from the sample, the debitage has an average weight of 0.64 g, while 93% of the debitage measures less than 2 cm and 67% measures less than 1 cm in maximum dimension.

Flake characteristics support the classification of the C1 assemblage as representing mainly secondary reduction activities (Fig. 8). There is almost no cortex in the assemblage, and 90% of proximal flakes exhibit multiple remnant flake scars on the dorsal surface, with an average count of three. Overall, flake platforms are either smooth or complex with very few cortical or collapsed platforms, indicating an absence of heavy early-stage percussion. Further, 80% of the smooth platforms in the assemblage are accounted for within the retouch debitage, indicating secondary-stage reduction of unifacial flake tools. Of the proximal retouch flakes, 215 (57%) have complex platforms likely relating to biface reduction, compared to 153 (43%) with simple platforms, more likely related to unifacial reduction.

Only three cores are present in the C1 assemblage: two amorphous, unprepared unidirectional cores and a bipolar core, all on quartz with multiple cortical surfaces. With an

TABLE 7. Counts and weights for all debitage, including cores and retouched flakes, except cobbles.

Material Type	Count			Weight		
	C1	C2	Total	C1	C2	Total
Argillite	114	63	177	23.0	15.9	38.9
Basalt	83	33	116	22.1	2.4	24.5
Chert	386	475	861	49.6	279.9	329.5
Chalcedony	281	446	727	23.7	33.9	57.6
MCS	14	22	36	5.7	8.5	14.2
Obsidian	0	86	86	0.0	5.6	5.6
Other	5	54	59	0.0	22.8	22.8
Quartz	107	1411	1518	1522.4	3176.7	4699.1
Quartz crystal	2	24	26	0.1	7.2	7.3
Rhyolite	160	848	1008	28.3	180.4	208.7
Total	1152	3462	4614	1674.9	3733.3	5408.2

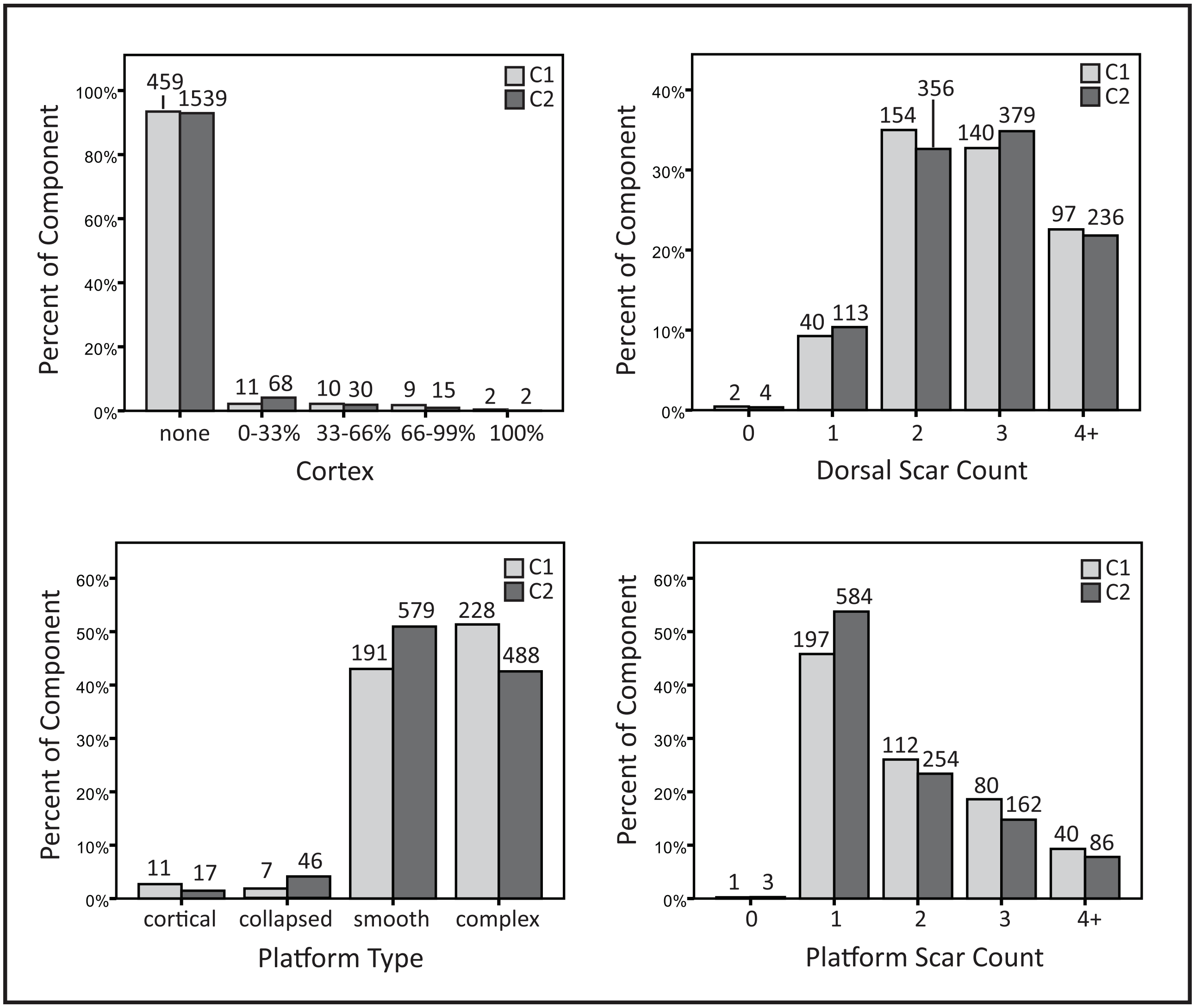

FIG. 8. Debitage characteristics for C1 and C2, shown as percentages of the debitage assemblage for each component. Debitage counts given above each bar. Cortex counts also include shatter.

average weight of 311 g and an average maximum dimension of 102.5 mm, they represent some of the largest pieces in the assemblage, and yet they are only informally reduced, with few faces and only four to seven flake scars per piece.

Component 2

C2 displays a relatively high proportion of flake tools, followed by bifacial preform fragments (Table 5). There is a heavy emphasis on the use of quartz and rhyolite in the debitage, compared to an emphasis on chert and rhyolite for formal tools (Table 6).

Bifacial Tools: While C2 contains 17 bifacially worked pieces, only three are finished hafted bifaces. These include one complete specimen of chert (Fig. 9l) and one of rhyolite (Fig. 9m). Both are lanceolate in outline, with narrow tongue-shaped bases and a combination of straight and slightly oblique parallel flaking. Slightly irregular in outline and cross-section, both exhibit proximal hafting abrasion and distal impact fractures. The third finished biface is a parallel and collaterally flaked lanceolate fragment on mottled cream and gray chert (Fig. 9k), which has been reworked into a bifacial flake tool after loss of the distal end as a result of impact fracture. Its distal end exhibits burin and scraping use damage, and its proximal end is broken along one margin and retouched into a steep scraping edge on the other. The remaining bifaces are two ovate preforms, one of chert (Fig. 9j) and one fragment on rhyolite; two large quartz bifaces, potentially cores or chopping tools (Fig. 10d, e); and eight thick, irregular unfinished biface fragments made on chert, chalcedony, and rhyolite. Two of the fragments show evidence of use retouch on broken and bifacially sharpened edges.

Flake Tools: C2 contains 25 flake tools (Table 5), eight of which are unidentifiable fragments of quartz, rhyolite, chert and chalcedony with evidence of working (for example, Fig. 10b). Eight of the identifiable tools are various forms of side and end scrapers. All but one rhyolite end

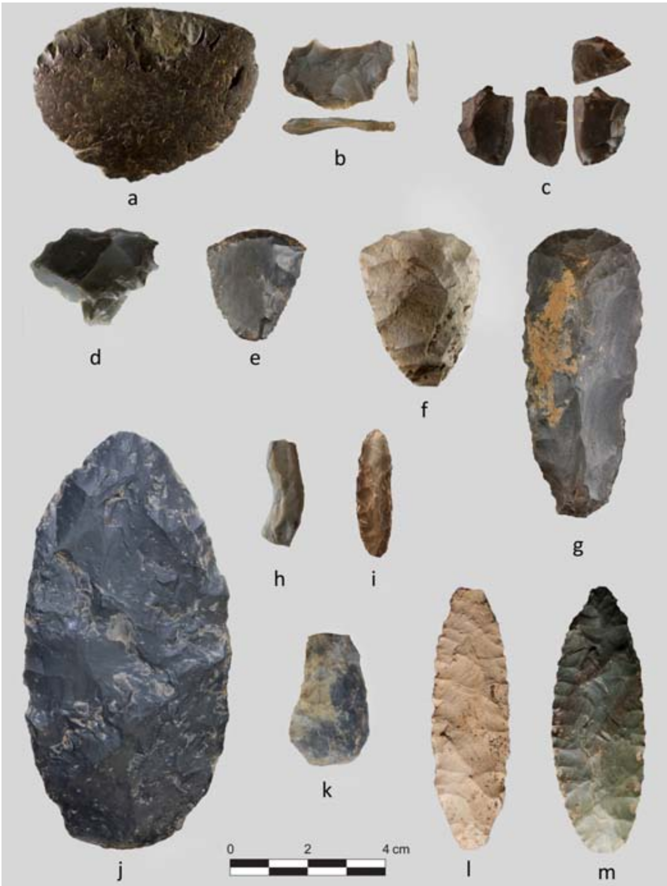

FIG. 9. Sample of C2 tools and bifaces: a, d–g, scraper tools; b, microblade core tablet; c, microblade core; h, burin spall; i, limace-like scraper; j, biface; k–m, lanceolate bifaces.

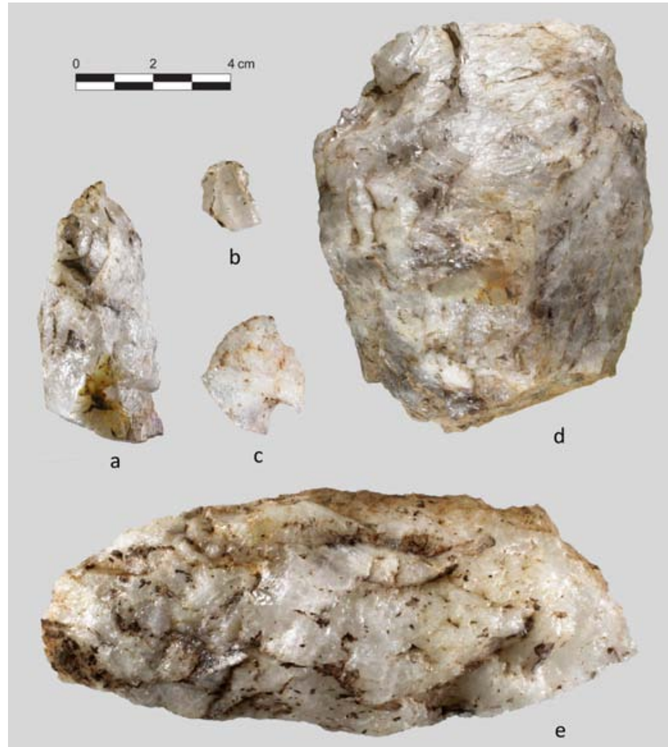

FIG. 10. Quartz tools from C2: a, scraper; b, flake tool fragment; c, combination tool; d, e, bifaces.

scraper (Fig. 9f) and one quartz side scraper (Fig. 10a) are made on thick gray chert flakes (e.g., Fig. 9e, g). With the exception of the quartz scraper, the tools lack cortex and were discarded unbroken.

The six combination tools in C2 include various working-edge combinations of scrapers, burins, notches, gravers, and bifacial tools and are made on a variety of sizes and types of quartz, quartz crystal, rhyolite, and chert. Three are simple burinated scraping tools; one (Fig. 9d) is a gray-chert multi-pronged denticulate, graver, and notch; another (Fig. 10c) is a quartz-crystal tool of unknown original form reworked into a notch with bifacial scraping edge; and the last (Fig. 9i) shows characteristics of a small, delicate limace, a double-sided scraper with rounded ends. It is re-worked to exhaustion, so that its two working edges meet in the middle. Finally, C2 includes a dihedral burin on a thin gray-chert flake, a burin on a chalcedony flake, and a large brown-chert cortical spall marginally retouched into a robust knife edge (Fig. 9a). Besides the formal flake tools, there are 18 marginally retouched flakes and fragments; half of these are on local quartz, while the remainder are spread between chert, obsidian, and rhyolite.

Microblade Technology: Microblade-related lithic pieces in C2 consist of a single microblade core of red chert (Fig. 9c), a thin, wide core tablet (Fig. 9b), a small chalcedony fragment with blade-like scars, and 30 microblades and fragments made almost entirely on gray and brown cherts. Microblades are mainly trapezoidal and include four complete pieces and 11 proximal, 12 distal, and three medial fragments. The core is so small and exhausted that its original shape and reduction process cannot be determined; it shows neither bifacial reduction nor a wedge-shaped outline. The tablet is round and might have come from a semi-conical core rather than a wedge-shaped form. It is very thin (2.8 mm), with a complex platform and four remnant flute scars located on the tablet's slightly hinged distal end, potentially indicating multiple fluted faces. Its upper surface exhibits remnant side-blow flaking, indicating multiple approaches to platform maintenance.

Debitage: The C2 debitage assemblage of 3462 pieces is dominated in numbers and weight by quartz flake fragments and shatter (Table 7). Flake fragments and secondary retouch flakes of rhyolite, chert, and chalcedony are the next most common (Table 6), with retouch flakes making up 22% of the assemblage. Shatter and simple core flakes make up 25% of the C2 debitage. The majority of shatter is composed of quartz; simple flakes are mainly quartz and rhyolite. Rare debitage includes microblades, cores, bipolar flakes, technical spalls (Fig. 9h), cortical spalls, potlidded fragments, and a cortex-covered cobble of unidentifiable material. Overall, debitage sizes are extremely small. Removing the cores and cobble from the sample, the debitage has an average weight of 0.67 g, despite the high proportion of blocky quartz pieces, which average 1.27 g. In terms of size class, 90% of the debitage pieces measure less than 2 cm in maximum dimension, and 62% less than 1 cm.

Although overall flake characteristics support the classification of the C2 assemblage as being mainly secondary retouch flake debitage, the local quartz debitage follows a distinct pattern. Quartz is represented mainly by primary debitage of shatter and simple flakes, with low platform counts and larger sizes compared to other debitage. Overall for C2, including quartz, there is almost no cortex, and the majority of proximal flakes exhibit more than one remnant flake scar on their dorsal surface (Fig. 8). For the assemblage overall, flake platforms are either smooth or complex with very few cortical or collapsed platforms, suggesting a low rate of early-stage heavy percussion. Although 58% of the smooth platforms in the assemblage are accounted for within the retouch debitage, indicating unifacial tool shaping and retouch, another 37% of the simple flakes are found within simple flake debitage, indicating that core reduction and flake detachment stages are also prominent. Of the retouch flakes, 395 (51%) have complex platforms related to biface thinning and retouch, compared to 338 (44%) with simple platforms, more likely related to unifacial reduction. The rest are unidentifiable.

Of the 16 cores in the C2 assemblage, 10 are on quartz, including four multidirectional cores, four unidirectional cores, one bipolar core, and two core fragments. They are large and blocky, with little preparation and an average weight of 86.1 g. Besides these, and the microblade core described above, the remaining cores are small, weighing an average of 5.8 g. They include two unidirectional rhyolite core fragments, a single completely exhausted multidirectional rhyolite core, a chert bipolar split pebble, a bifacially worked chert core, and a quartz-crystal core fragment.

LITHIC MATERIAL USE AND TECHNOLOGICAL ORGANIZATION AT LINDA'S POINT

Toolstone Selection

Throughout prehistory, a few major aspects of lithic material procurement and use appear to have consistently influenced the choices made by occupants at Linda's Point. A lack of high-quality local materials has led to variety in the materials brought to the site from regional and exotic locations, seen mainly in late-stage lithic reduction, exhausted cores of high-quality material, and highly curated tools. However, there is a distinct difference between components in the treatment of lower-quality locally available quartz, which is largely ignored in C1 but became a focal point of an expedient and informal industry in C2, making up nearly half of the C2 assemblage. Rhyolite, slightly coarser than the cherts and chalcedonies, also became relatively more prominent in C2, especially within the tool assemblage. Overall, there appears to be greater selectivity in the Holocene, with quartz used more often for expedient tools, cherts for microblades and flake tools, and rhyolite for bifaces. Although some selectivity in the C1 occupation is seen in a general preference for chalcedonies, it is seen for all tool types, with a variety of other material types following no discernible patterning.

Tool Production and Reduction Strategies

There is a marked difference between components in terms of the toolkits being worked and used on site, potentially reflecting differences in activities and site occupation over time, most notably a diminished emphasis on biface use in C2. For C1, bifacial pieces make up 47% of the formal tool assemblage, and all but two fragments are finished tools or hafted bifaces. For C2, bifacial artifacts make up 40% of the formal tool assemblage, but only three are finished hafted bifaces, and the remainder are rejected, generalized preforms and partially worked bifacial tools. Flake-tool technology is relatively expedient in both components, with a wide variety in shape and size, and high frequency of informal marginally retouched flakes. In general, however, C2 flake tools are more curated than those from C1, with higher proportions of combination tools (25% of the flake tools per component versus 10% for C1) and an overall lower proportion of expedient marginally retouched flakes (20% of all C2 tools compared to 35% for C1).

Both components at Linda's Point have relatively high proportions of late-stage reduction debitage and a low proportion of simple flakes and cores. Early-stage debitage, seen mainly as large, blocky pieces of local quartz, is more prevalent in C2. Reduction technologies in C2 are also more diverse; C1 debitage reflects the byproducts of core-and-flake reduction and bifacial reduction, while the C2 assemblage reflects these as well as specialized burination retouch and microblade production. In comparison, C1 exhibits a slightly greater emphasis on bifacial versus unifacial retouch, consistent with the higher proportion of discarded bifaces.

Patterns of Lithic Material and Landscape Use

The emphasis on late-stage secondary reduction of nonlocal materials in both components indicates that inhabitants manufactured many tools off-site and then transported their materials to Healy Lake to be used, reworked, and occasionally discarded. This pattern appears to have changed little through time and is expected, given that few toolstone resources are available at Linda's Point, while the local quartz that is available is riddled with inclusions and incipient fractures. Substantially higher proportions of quartz debitage in C2 most likely indicate a potential shift in lithic procurement strategies from dominantly nonlocal in the terminal Pleistocene to more locally focused in the Younger Dryas and Holocene. Alternatively, this pattern could be the result of sampling, and the current discussion may require adjustment upon future excavation.

The earliest site inhabitants preferred a lithic technological strategy emphasizing curation and transport of materials, so that they could carry tools manufactured at one site to the next one when the group moved within their settlement range, rather than manufacturing new, locally sourced tools at the new camp (Odell, 1996). We hypothesize that the use of local materials became more important later in time as inhabitants became more familiar with the area and its resources and established larger, band-sized groups rather than highly mobile foraging groups. As larger groups lengthened their residence time at Linda's Point, raw material choices might have shifted towards locally accessible toolstone (Kelly, 1988, 1992; Surovell, 2009). This theory is consistent with the observed patterns of material use in C2, such as increased use of local materials, decreased curation, and a decreased reliance on highly portable bifacial technology. Similarly, the increased selectivity seen in C2 may be the result of more sedentary populations' conserving non-local, high-quality transported toolstone for more delicate knapping tasks, such as microblade production. The presence of a pit-hearth feature in C2, compared to the apparently unlined hearths in C1, suggests increased energy investment in feature construction and provides further evidence for increased occupation length. While exotic obsidian could be evidence of embedded procurement in a developing logistical settlement system, it might also reflect developing regional trade networks, given increasing obsidian usage throughout Alaska in the Holocene.

Alternative environmental explanations for the shift in toolstone emphasis might be that quartz material was accessible at different locations during the terminal Pleistocene as a result of erosion, fluvial sorting along riverbanks, or seasonal coverage by snow or marshy vegetation. Rising lake levels and erosion, perhaps in the late Pleistocene or perhaps during the Holocene, might have exposed new quartz seams along the shoreline, providing materials directly accessible near the site. The occupants of the earliest component might have flintknapped quartz materials farther off-site at exposures on the Healy River or open floodplain. However, the presence of many large schist and quartz feature stones in C1 indicates that at least some sources of bedrock were available nearby during the earlier occupation, and the low presence of smooth cortex on quartz debitage in both components indicates procurement from eroded bedrock exposures rather than smaller, weathered ventifacts.

Rather than affecting lithic procurement alone, the changing environmental context of the Healy River basin likely also affected the role of Linda's Point within regional subsistence and settlement strategies. The transition from a high-energy riverine environment to a shallow lake with numerous deltaic wetlands likely increased the long-term habitability of the site, providing a wider array of available resources and increased accessibility to the Tanana River. A transition away from residentially mobile settlement patterns would be explained by Holocene impoundment and rising lake levels and was further encouraged by increasing Holocene forestation and the subsequent shift from large seasonally predictable herd animal populations to individually encountered, solitary browsing ungulates drawn to lakeshores and wetlands.

The presence and meaning of a Holocene transition to a local quartz industry may be explored by further testing and excavation around the lake margins. Localized presence of different reduction stages, such as core testing or decortication at collection sites, or discard of more carefully finished tools at hunting or fishing sites, would indicate increased logistical mobility. An increase in the proportion of quartz at multiple sites over time would provide more generalized evidence for reduced residential mobility and longer site occupation times. Cook identified local quartz material at the Village site, calling it quartzite because of the presence of macroscopic, grain-like crystals (Cook, 1969). As with the Linda's Point quartz, flakes of this material were notably larger than those of other materials. He identified the presence of a "Quartzite Horizon"—a pulse of quartz activity in the transitional levels between the Chindadn and Athabascan levels around 9000 cal BP—but in fact, he noted a "conspicuous scarcity" of it in the upper levels (Cook, 1969:131), indicating that the pattern may be more complex than can be interpreted through data from Linda's Point alone. However, this interpreted scarcity is based on flake counts, and Cook's data show that quartz is actually quite prevalent in terms of weight (Cook, 1969:131–135). Clearly, further study in the Healy Lake area is needed to clarify the question of a local Holocene quartz industry.

REGIONAL CONTEXT

Cultural Chronology

The archaeological record at Linda's Point can answer long-debated questions about the stratigraphy, tool assemblages, and cultural chronology at Healy Lake. Thus far at Linda's Point, microblades, microblade cores, and lanceolate bi-points have been found only in the upper strata. They are clearly spatially separated from the small triangular "Chindadn" points associated with multiple hearths in the basal deposits, dating near 12 000–13 000 cal BP. Although occurring later in time, the C2 quartz items are suggestive of a "Quartz Horizon" similar to that originally proposed by Cook. Given these results, caution is advised in the use of the original definition of the Chindadn complex, which spanned 4000 years. It encompassed the rapid environmental fluctuations of the terminal Pleistocene, including the Allerød warm interval, the sharp cooling of the Younger Dryas at 12 800–11 700 cal BP, and the return to warmer temperatures during the first millennium of the Holocene (Graf and Bigelow, 2011). Thus its temporal context is even broader than the overarching concept of the East Beringian Tradition (Holmes, 2011). Such broadly defined complexes and traditions inherently pose the danger of glossing over a wide range of potential cultural and behavioral variability, potentially implying static—rather than responsive and adaptive—cultural systems (Odess and Rasic, 2007).

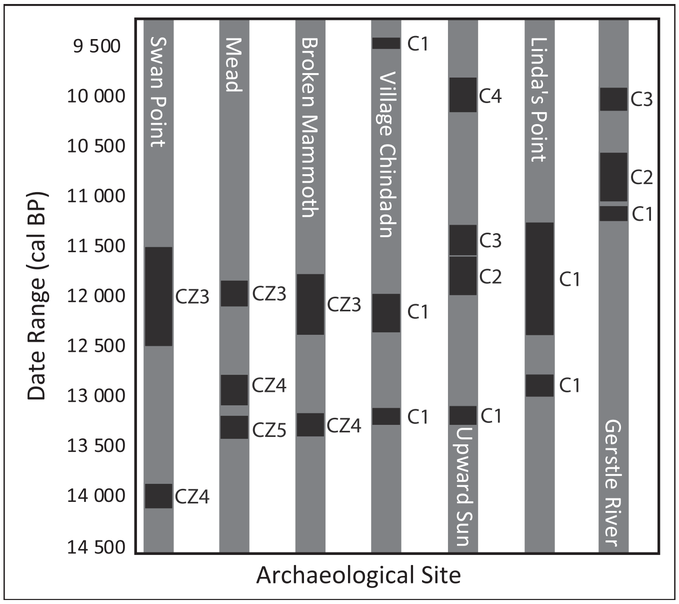

FIG. 11. Age ranges of terminal Pleistocene components of archaeological sites in the Tanana basin. Calibrated dates from Cook (1996), Holmes (2011), and Potter et al. (2013).

Extending the results from C1 farther into a regional context adds to the culture history of the middle Tanana as well. At this time, the LPEH is represented in the middle Tanana by a number of well-dated components spanning from 14 200 cal BP to the beginning of the Holocene, covering the entire timeline originally proposed to be encompassed within the Chindadn complex, and slightly earlier at Swan Point (Fig. 11). The dates at the earliest components of Linda's Point and the Village site cluster into discrete, nonoverlapping date ranges, strongly correlative to occupations at Swan Point, Broken Mammoth, Mead, and Upward Sun. These early components, notably Swan Point CZ3, Broken Mammoth CZ3, and Mead CZ4, share characteristics similar to those at Healy Lake: numerous ephemeral hearths, Chindadn bifaces, and rare or ambiguous microblade technology, focused within a time range of 13 000 to 11 500 cal BP, and as early as 13 500 cal BP at the Village site. These sites are located in similar lowland settings, overlooking wetland deltas along the glaciofluvial floodplain of the Tanana River.

Subsistence patterns indicate a variety of large mammal prey in the oldest sites in the Tanana, while early Holocene subsistence shows a range of large mammal species and a wider range of small mammal species than in the preceding Allerød or Younger Dryas assemblages (Potter et al., 2014a). Potter and colleagues suggest a potential link between Chindadn points and upland sheep and caribou hunting, compared to lower-terrain bison and wapiti hunting for microblade technology. They point to evidence of caribou and sheep hunting in Nenana Valley components compared to a heavier presence of bison in lowland Tanana sites, which have a longer history of microblade technology (Potter, 2011; Potter et al., 2014a). However, microblades are present in upland components in the Nenana dating to the Younger Dryas, and a wide array of Chindadn points are present in lowland Tanana basin sites that contain a variety of faunal remains and exhibit complex chronological patterning.

Initial evaluation of the Linda's Point faunal materials, though not presented here, indicates similarities to the regional pattern, with a focus on larger mammals in C1 and a variety of smaller mammals in C2. The presence of a crescent-shaped biface in C1, similar in outline to lunate crescents of the Northwest Coast (Moss and Erlandson, 2013), hints at greater diversity. Crescents from Northwest Coast and Great Basin wetland locations are commonly medially edge-ground in a manner similar to the Linda's Point specimen, which is interpreted to facilitate hafting suggestive of ethnographically recorded lunate bird-hunting points (Moss and Erlandson, 2013). Lowland Tanana Valley site locations like Healy Lake would have presented ideal locations for the hunting of waterfowl throughout prehistory, and the regional archaeological record presents concurring evidence for the early development of a broad-spectrum diet beyond the pursuit of megafauna. A crescent-like biface found in the CZ3 component of Swan Point (Holmes, 2011:Fig. 10.9.h) resembles "butterfly" or "trapezoidal" crescents in existing typologies (Moss and Erlandson, 2013), while avian and fish remains are found at Mead CZ3, Swan Point CZ3, and Broken Mammoth CZ3 (Holmes, 2011; Potter et al., 2014a). In comparison, the older Swan Point CZ4, with its associated Diuktai microblade assemblage, is heavily focused on processing of megafauna (Potter et al., 2014a). Clearly, Beringian subsistence patterns are more complex than can be assessed through the current small sample of preserved faunal remains. Detailed faunal analysis at both Linda's Point and the Village site is needed to place Healy Lake in the context of regional subsistence patterns.

Adaptive Strategies of Lithic Resource Use

Linda's Point C1 follows many of the existing patterns of LPEH sites in interior Alaska—multiple hearths with faunal remains, accompanied by debitage, flake and blade tools, and small bifaces. Toolstones are dominated by fine-grained chalcedonies and cherts, acquired off-site but presumably within the general region. Obsidian is rare, especially in comparison to Holocene occupations. Raw materials seem to be chiefly extra-local.

Current data indicate that a variety of lithic resource-use strategies existed within the Alaskan interior. At Walker Road in the Nenana Valley, detailed lithic technological analysis showed extensive use of locally available river cobble materials, accompanied by a prevalence of early-stage reduction (Goebel, 2011), which is interpreted to reflect a settlement system relying on local materials to reduce transport costs. Similar patterns are seen in Dry Creek Component I (Graf and Goebel, 2009), while the presence of nonlocal materials increased in the later Component II, accompanied by a decrease in cortex and an increase in secondary and finishing stages of reduction. In the Tanana Valley, Mead CZ3b shows a combination of local and nonlocal material use; discarded tools are of nonlocal materials, while on-site reduction focused strongly on local gray chert (Little, 2013). The slightly earlier Mead CZ4 shows patterns similar to those at Linda's Point C1, with a limited number of material types used compared to other components and a focus on curated chalcedony tools, which are interpreted to indicate higher mobility and shorter occupation times than CZ3. However, unlike Linda's Point C1, CZ4 has a heavy focus on local quartz, which is interpreted to relate to opportunistic use rather than habitation length or group size (Little, 2013). Overall, current studies of material use throughout the LPEH indicate variability in lithic procurement and usage and seem to reflect flexibility to account for toolstone availability on the landscape and duration of occupation, rather than overarching cultural tendencies.

CONCLUSIONS AND FUTURE RESEARCH

Our results suggest that the Linda's Point site was used as a residential camp during the occupation of both components. Hearths and highly fragmented burnt and calcined animal bone represent domestic cooking and marrow extraction. Small sharpening and retouch flakes, combined with discarded broken projectile points, microblades, small flake tools, and exhausted cores, represent the maintenance of a variety of tools for hunting and hide-working. Finally, the presence of burins, burin spalls, steep-angled side scrapers, and spurred flake tools and gravers indicate the working of osseous and woody materials. Lithic raw materials are diverse, and debitage overall is small and focused on secondary reduction activities, indicating the use and reuse of tools manufactured elsewhere. These patterns are consistent with the overall lack of local raw-material sources apart from local quartz deposits. All of these characteristics are consistent with human use of an accessible, low-terrace landform, near to water and to wetland resources, and ideal for habitation by a full residential group.

C1 seems to represent multiple short-term occupations, with numerous, nearly overlapping ephemeral hearth features and scattered lithic deposits. Tools for faunal processing are present but expedient, while there is a notable emphasis on the use and discard of small finished bifaces. C2 is represented by dense scatters of lithic and calcined bone fragments, combined with the presence of intensive early-stage reduction of local quartz, suggesting increased use of local resources and hence longer durations of occupation than during the terminal Pleistocene. The presence of a 9000-year-old flake-and-charcoal-filled pit feature indicates that occupations may have been less transient, with more time taken for the building of fires or disposal of refuse in an organized camp structure.

The currently excavated area is small but has provided a high density of features and materials with precisely defined stratigraphic contexts, showing promise that further excavations using contemporary excavation methods would help to delineate subcomponents within C1 and C2 and further clarify the Healy Lake archaeological record. Expansion of the existing excavation block will enhance the interpretation of activity areas and relationships between features at the site, while addition of new excavation areas will show whether the patterns observed here are consistent across the site or show variation within more complex site structures. Continued excavation of surrounding sites along the lake margins, as well as comparisons to contemporary occupations along the Tanana, will help to establish local and regional patterns of differentiated lithic adaptive strategies and settlement patterns. These in turn will help to illuminate our understanding of human responses to LPEH environmental change and ultimately, of the early human settlement of Beringia.

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