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Ancient Burials at Upward Sun River, Central Alaska

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In the late summer about 11,500 years ago, probably in the space of a few weeks, three young Paleoindian children died and were buried in a residential camp alongside *Xasaa Na'* (Upward Sun River). An infant and neonate were buried together with associated funerary objects below a central cooking hearth, and later a ~three-year-old child was cremated and buried above the same feature. This article explores the lifeways of the Ancient Beringians that summer, reconstructed through zooarchaeology, stable isotope, spatial, and artifact analyses and implications of the mortuary treatment of these individuals with respect to the regional group, the Denali Complex, and early Paleoindian ideologies.

Beringia, burials, Denali tradition

大约 11,500 **年前的夏末，大概在几周的**时间里，三名古印第安儿童去世，**并被埋葬在** Xasaa Na'（Upward Sun River）**旁的宿**营地中。**一名**婴儿和一名新生儿与相关的陪葬品一起被埋葬在中央烹饪炉灶**下方，后来一名**约 3 岁的孩子被火化并埋葬在同一地点上方。**本**

文探讨了那个夏天古代白令海峡人的生活方式，通过动物考古学、稳定同位素、空间和文物分析重建了这一生活方式，并探讨了这些人的丧葬处理对该地区群体、德纳里综合体和早期古印第安意识形态的影响。

Introduction

Paleoindian burials are very rare in the archaeological record—and the few published examples offer important insights into mortuary and ritual behaviors otherwise invisible to archaeologists (Green et al. 1998; Owsley 2010; Owsley and Jantz 2014; Powell 2005). While numerous studies have focused on technologies and subsistence economies of the earliest Americans, we are at an early understanding of meaningful considerations of ideology, ritual, and beliefs, particularly how they may reflect and affect overall lifeways and adaptations as they expanded from Northeast Asia into the Americas through Beringia (Meltzer 2021). The recovery of three ancient individuals from the Upward Sun River (USR) site, dating to the Pleistocene/Holocene transition, offers unparalleled opportunity to examine mortuary behaviors relating to multiple individuals of different age classes (~three years old, three to four weeks old, and late-term prenate) from a single complex feature associated with a residential base camp of a major cultural group in the far north: the Denali tradition (*sensu* Holmes 2008) (12,500–6000 cal yr BP).

USR, named *Xaasaa Na'* [Upward Sun River] in the local Salchaket (Dene) dialect, is located near the Tanana River in central Alaska (eastern Beringia). It is arguably one of the most significant sites in the Americas, yielding (1) the second earliest burials in the Americas (after Anzick Clovis); (2) the remains of three individuals dating to 11,500 cal yr BP, belonging to a newly discovered basal Native American genetic population termed *Ancient Beringians*;

and (3) one of the oldest residential sites, with evidence for three residential features (Potter et al. 2011, 2014; Moreno-Mayar et al. 2018a). This article summarizes and expands upon extant published information on the site, including seven new figures and content, to provide additional context for interpretation of complex mortuary behaviors.

In 2010, we discovered remains of a three-year-old individual cremated within a central cooking hearth of a residential feature, named *Xaasaa Cheege Ts'eniin* [Upward Sun River Mouth Child] (Potter et al. 2011). In 2013, while excavating under the cremation hearth, we discovered a double burial: a three- to four-week-old female named *Xach'itee'aanenh t'eede gaay* [Sunrise Girl] and late-term prenate female named *Yełkaanenh t'eede gay* [Dawn Twilight Girl], from the Salchaket dialect of the Upper Tanana (Dene) language. With support from local and regional Alaska Native authorities and partners, we excavated and analyzed these individuals (Potter et al. 2014).

The site is situated on a loess-mantled sand dune within a ~2,800-acre dune field south of a major braided glacier-fed river. The site contains six components, dating between 13,200 cal yr BP to the late Holocene in deeply buried contexts (~260 cm of loess over >640 cm of aeolian sand). Component 3 is stratigraphically separated from older and younger cultural remains and contains the burials and house features dating ~11,500 cal yr BP (see below). Stratigraphy, site formation and taphonomic analyses have been previously reported (Potter et al. 2008, 2011, 2014; Reuther 2013). These data, including backscatter plots, horizontal artifacts and clusters, and no evidence for size sorting, confirm a lack of post-depositional disturbance consistent with horizontal paleosols above and below Component 3.

Geoarchaeological Context and Radiocarbon Dating

Detailed geoarchaeological analyses are reported in Potter et al. (2008, 2011, 2014), Reuther (2013), and Choy et al. (2016). Component 3 is the most expansive and largest component,

found throughout the site about 100 cm below surface within a C horizon of loess (aeolian silt). All Component 3 features and artifacts are present in a thin unimodal vertical distribution in the same stratigraphic position, 14 to 20 cm below Paleosol Ab3 (Potter et al. 2011). Six features interpreted to be outdoor hearths were dense, thin concentrations (lenses) of charcoal and oxidized sediment, most associated with calcined bone fragments (Fig. 1). Three hearths were much larger in dimension and thickness, ~10 cm thick, with charcoal overlying local oxidized sediment lenses. In addition, they contained bone- and ash-rich layers above the oxidized sediment and interspersed with the dense charcoal. These three hearth features (F2010-5, F2013-9, F2014-6) are in the center of dense concentrations of artifacts, representing a circular arc of debris. Localized concentrations of small pebbles and ochre concentrations are found within a 3-m diameter area of F2013-9 and F2014-6, with a near absence in the surrounding areas, all consistent with use as residential features. The third feature, F2010-5, is surrounded by a dense charcoal ring also about 3 m in diameter. Postmolds were observed surrounding the central cooking hearth (Potter et al. 2011). This hearth contained the remains of the cremated individual, USR3. The burial pit associated with individuals USR1 and USR2 was discovered directly below this hearth. We infer that the charcoal ring is due to burning of the structure after the cremation of USR3.

Site chronology is securely controlled through 41 ^{14}C dates on multiple cultural features, stratigraphic layers, and snail shells (Potter et al. 2008, 2011, 2014). The burials were tightly constrained through multiple statistically similar ages on an upper charcoal layer representing the top of the cremation hearth back-fill and charcoal produced in the cremation hearth, which averaged 9,990 ± 30 ^{14}C yr BP (11,690–11,320 cal yr BP) (Potter et al. 2011). The lower burial excavated through the hearth prior to the cremation is directly dated through charcoal adhering to one associated antler rod at 9,930 ± 50 ^{14}C yr BP (11,610–11,230 cal yr

BP) (Beta-371567) (Potter et al. 2014). Other cultural hearth features from Component 3 date between 9,720 ± 50 and 10,120 ± 50 ^{14}C yr BP (11,240–10,810 to 11,930–11,400 cal yr BP). Overlying paleosols associated with Component 4 date to 8,850 ± 50 and 8,880 ± 40 ^{14}C yr BP (10,170–9,720 and 10,180–9,780 cal yr BP) and underlying paleosols associated with Component 2 date to 10,090 ± 50 and 10,180 ± 50 ^{14}C BP (11,870–11,350 and 11,998–11,510 cal yr BP) (Potter et al. 2008, 2014). Additional evidence for contemporaneity of the cremation/burial and other Component 3 features includes a thin, unimodal vertical distribution of all cultural materials, consistent horizontal depth below surface, and absence of post-depositional disturbance. The cremation (hearth) and burial (pit) dates are statistically the same and yield a mean pooled age of 9,973 ± 27 ^{14}C yr BP (11,610–11,270 cal yr BP), or ~11,500 cal BP (Potter et al. 2014).

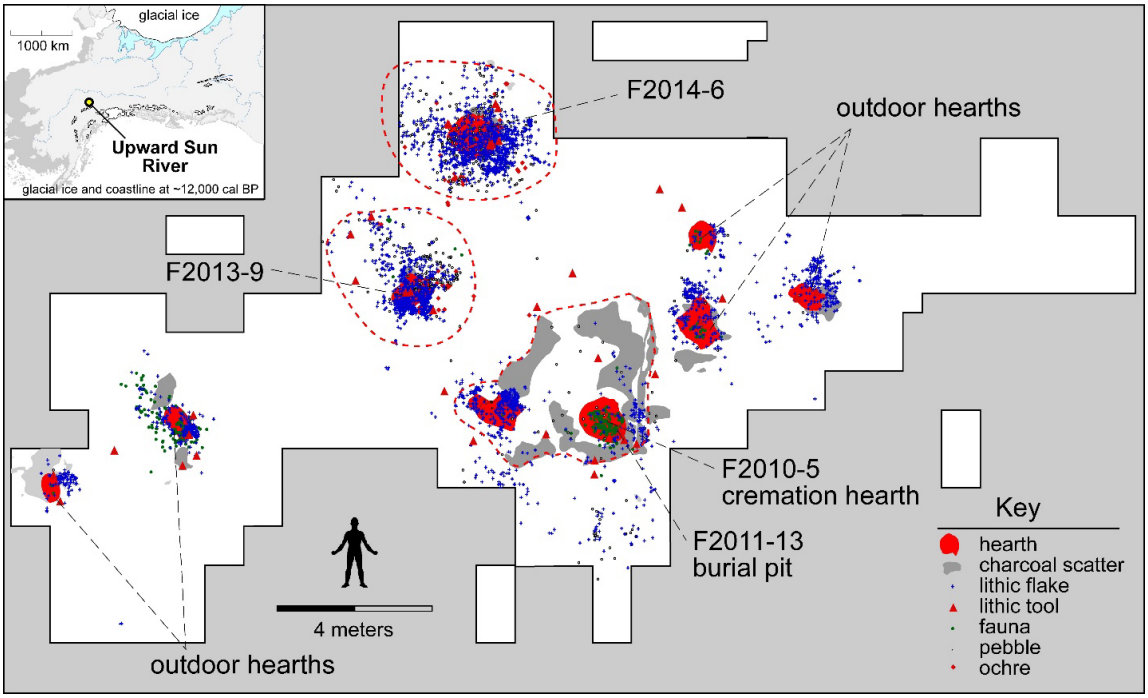

Figure 1. Plan view of Component 3, showing burial features and inferred residential features.

Cultural Affiliation

Several bifacial projectile points were recovered from USR, Component 3, including two complete forms in the burial, as associated funerary objects, along with other broken and

fragmented bifacial pieces interpreted to function as knives and points (Potter et al. 2014). USR points are most consistent with interior Beringian/Subarctic Denali tradition foliate forms (Hare et al. 2008; Powers et al. 2017; Workman 1978). These willow leaf foliate points are common in Denali contexts, including the Little Arm phase in Yukon Territory (Hare et al. 2008). Bifacial knives, inferred from morphology, asymmetry, and lack of edge grinding or impact fractures, are also similar to Denali tradition convex-based and spatulate bifacial knives found in Component II at Dry Creek, Delta River Overlook, Niidhaayh Na', and other sites (Doering et al. 2021; Potter et al. 2018; Powers et al. 2017). Denali tradition sites often (but not always) contain microblade and burin technology, and none were found at USR. However, at the nearby Little Delta River No. 3 site, located about 5 km away from USR, a large lithic assemblage contained both microblades and similar foliate bifacial points (Potter et al. 2007) (Fig. 2). Denali tradition sites are widespread in the region from 12,500 to 6,000 cal yr BP (Clark and Gotthardt 1999; Holmes 2008; Potter 2008a); no other cultural tradition is present within the Tanana basin during this period (Fig. 3). Given these data, we infer that the USR Component 3 represents a Denali tradition occupation.

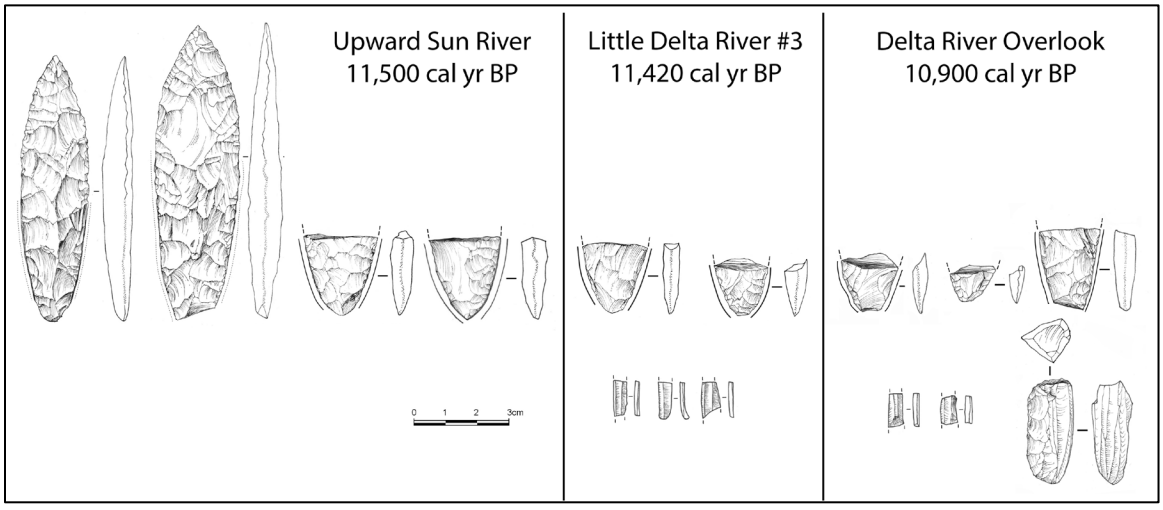

Figure 2. Bifacial points and microblade technology from USR and nearby Denali tradition sites. (illustrations by Eric Carlson).

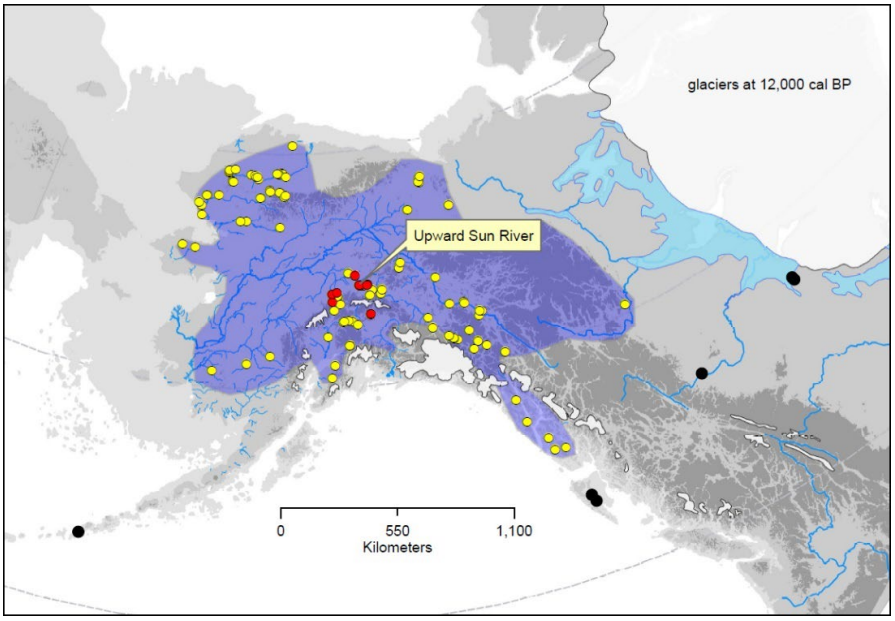

Figure 3. Geographic extent of the Denali tradition. Cloud derived from sites attributed to the Denali tradition (12,500 – 11,000 cal yr BP as red points, 11,000 – 6000 cal yr BP as yellow points) and other sites, wedge-shaped microblade cores (black points). (Data from Potter 2008a).

Genetic Affiliation

Detailed genetic analyses have been conducted and published for the two infants from the burial pit feature (Moreno-Mayar et al. 2018a; Tackney et al. 2015), providing transformative new data on the peopling of the Americas and genetic structure within Native Americans. Both individuals had distinct mitochondrial haplotypes: USR1 was C1b and USR2 was at the root of B2, indicating they had different mothers (Tackney et al. 2015). Additional autosomal analyses indicate they were closely related, perhaps half-siblings or first cousins (Moreno-Mayar et al. 2018a).

Analyses from USR1 (*Xach'itee'aanenh t'eede gay*) indicated that all Native Americans descend from a single founding population. Importantly, USR1 (and the other two individuals at the site) were part of a newly discovered genetic group termed *Ancient Beringians*, which are the most basal branch of Native American lineages (Moreno-Mayar et al. 2018a). Ancient Beringians are thus a sister clade to all other modern and recent Native Americans.

Using USR1's high-quality genome (14X coverage), the following scenario was proposed in Moreno-Mayar et al. (2018a; summarized in Fig. 4), which is still consistent with current genetic research (Kilinc et al. 2021; Sikora et al. 2019; Wang et al. 2023). A single founding population of ancestral Native Americans began to diverge from East Asians about 36,000 years ago, with strong gene flow until ~25,000 years ago. An admixture event took place around 25,000–20,000 years ago, with 40% of ancestral Native American genes derived from Ancient North Eurasian, likely located in southern Siberia. This study found long-term genetic structure in ancestral Native Americans, consistent with the Beringian Standstill Model. Around 22,000– 18,100 years ago, ancestral Native Americans split into two basal groups: (1) Ancient Beringians and (2) all other Native Americans. The latter split into two groups sometime between 17,500 and 14,600 years ago, into a North Native American (NNA) lineage including Dene and Algonkian speakers and a South Native American (SNA) lineage that included most other indigenous groups in North and South America (Raghavan et al. 2015). Gene flow between Ancient Beringians and SNA lasted until about 10,000 years ago, and gene flow with NNA lasted until about 5,000 years ago (Moreno-Mayar et al. 2018a). An additional Ancient Beringian individual was identified from a single tooth at the ~9,000-year-old Trail Creek Cave site in the Seward Peninsula, associated with Denali tradition materials like slotted points and microblades (Moreno-Mayar et al. 2018b). These are the only known Denali human remains, and USR represents the only known Denali burial.

Thus, Ancient Beringians likely arrived later than other Native Americans (SNA-NNA ancestors), expanded into eastern Beringia (Alaska) by at least 12,500 years ago, and remained well adapted in the early Holocene Subarctic for millennia, at least until 6,000 years ago. We are limited by very few ancient Dene individuals, who may have entered Alaska along with the Northern Archaic tradition (6,000 to 1,000 cal yr BP) (Dumond 1969, 1987; Potter 2008b;

Workman 1978). However, Ancient Beringians may have been replaced or absorbed by incoming Dene peoples in the middle Holocene. Certainly, Denali tradition technologies persisted into the later Northern Archaic tradition, particularly in the middle Tanana River basin, including wedge-shape microblade cores (Campus Type) and burins (Holmes 2008; Potter 2008a). They suggest some level of continuity between Ancient Beringians and modern Dene peoples of the region.

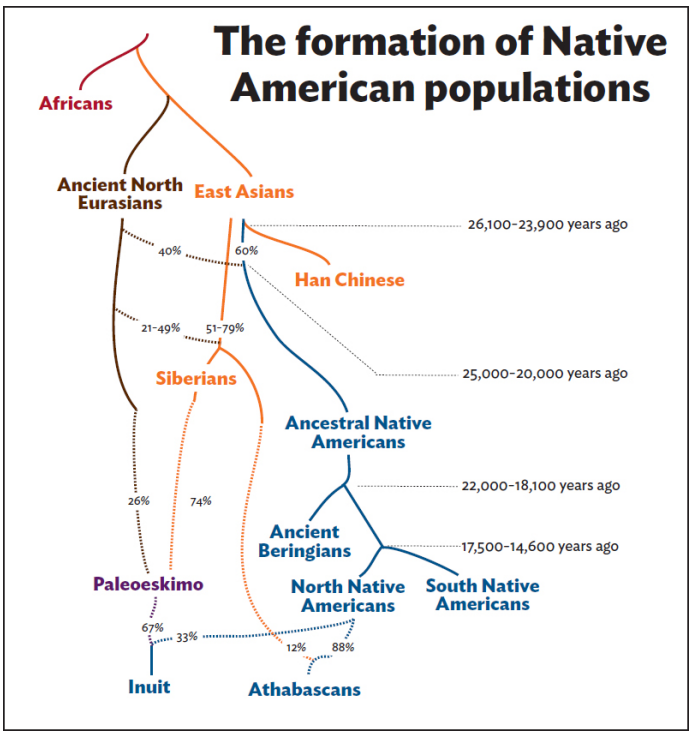

Figure 4. A model of the formation of Native American ancestral populations, showing Ancient Beringians in context with other related populations (from Moreno-Mayar, Potter, et al. 2018a).

Bioanthropological Analyses

Skeletal and dental analyses for USR1, USR2, and USR3 were conducted by Irish and reported in Potter et al. (2011, 2014). No indications of hard tissue anomaly, pathology, or trauma are evident on any of the individuals. Morphological traits on the extant deciduous teeth are consistent with the Sinodont pattern of Northeast Asians and Native Americans (Sciulli 1989; Scott and Turner 1997). Both USR1 and USR2 remains are well preserved and appear to be 100% complete skeletally, though post- depositional damage led to the breakage of fragile

elements. Age at death was estimated using osteometric measurements (Black et al. 2009; Fazekas and Kosa 1978; Gindhart 1973; Jeanty 1983; Scheuer et al. 1980; Scheuer and Mclaughlin-Black 1994) and deciduous crown development (AlQahtani 2009; Liversidge and Molleson 2004; Ubelaker 1989), indicating USR1 survived birth probably by around six weeks, while USR2 was a late-term fetus about 33 gestational weeks. All skeletal elements were coated in red ochre. Height and weight estimates derived from osteometric dimensions are ~43.36 cm and ~1725.5 g for USR1 and ~40.1 cm 1377.6 g for USR2 (Fazekas and Kosa 1978).

For USR3, the cremation was nearly complete (see Irish et al. 2015). Less than 20% of the skeleton survived, primarily the posterior cranium and fragments of most deciduous and unerupted permanent tooth crowns along with some postcrania. The burned human bones vary from black to white (completely calcined) in color, indicating temperatures ranging from 300ºC to +800ºC (Mayne Correia 1997; Mays 1998; Walker et al. 2008) with a potential burning duration between one and three hours (Buikstra and Swegle, cited in Shipman et al. 1984; Walker et al. 2008). The variation in combustion indicates that USR3 was not moved once burning commenced (e.g., McKinley 2015). Skeletal sex determination was not possible as the most sexually dimorphic elements are missing. The age of USR3 was estimated based on state of dental eruption and formation as around three years (AlQahtani 2009; Liversidge and Molleson 2004; Ubelaker 1989). Collectively, these three individuals represent some of the youngest Paleoindian remains found in the Americas (Meltzer 2021).

Lifeway: Seasonality and Subsistence

Sites in the middle Tanana River basin, like USR, have yielded substantial information on late Pleistocene and early Holocene lifeways in eastern Beringia, primarily due to excellent organic preservation and well-stratified, deeply buried contexts (e.g., Lanoë and Holmes 2016; Potter 2007; Yesner 2001). However, analyses at USR have yielded transformative data bearing on the

cultural adaptations and subsistence strategies of early Alaskans, and these are summarized here (Choy et al. 2016; Halffman et al. 2015, 2020; Potter et al. 2011, 2014, 2023). The faunal record at USR is robust, yielding thousands of NISP (number of identified specimens) of multiple taxa. The most common species within the cremation hearth and burial pit fill are *Oncorhynchus* sp. (salmon) (NISP = 362), *Urocitellus parryii* (ground squirrel) (NISP = 242), and *Lepus americanus* (snowshoe hare) (NISP = 48), along with other small mammals and terrestrial birds (e.g., *Marmota* sp [marmot], Tetraoninae [ptarmigan/grouse]) (Choy et al. 2016; Potter et al. 2014). Salmon (genetically identified as chum, *Oncorhynchus keta*) was present across the site in multiple activity areas, including the cremation hearth and pit fill (Choy et al. 2016; Halffman et al. 2015, 2020). Highly fragmented specimens of very large mammals, likely bison (*Bison priscus*) and wapiti (*Cervus canadensis*), were also recovered but not identified to taxon (Halffman et al. 2020).

Subarctic forager subsistence is likely structured around seasonal land use (Binford 1980, 2001; Kelly 2013), and multiple proxies were used to estimate season of death of the USR infants and occupation of the site. As noted, the infants were buried in a pit feature excavated within a central cooking hearth of a residential structure. The backfill contained burned fauna from earlier consumption events. Faunal diversity is nearly identical between the cremation hearth and the pit fill: salmon and immature ground squirrel predominant, with both indicating a late July or early August occupation (Halffman et al. 2020; Potter et al. 2011, 2014). Macrobotanical remains within the hearth include *Arctostaphylos uva-ursi* (bearberry), *Rubus* cf. *R. arcticus* (nagoonberry), and *Vaccinium* sp. (bog blueberry/low- bush cranberry), whose ripening and harvesting period is typically in the same seasonal window (Halfmann et al. 2020; Holloway 2016). All contextual data indicate a single relatively brief occupation, perhaps a few weeks or less (e.g., no feature blurring, no palimpsests, limited evidence of cleaning/clearing, and the nearly identical suite of fauna).

The first comprehensive paleodiet reconstructions of Paleoindian individuals were conducted on USR1 and USR2, based on multiproxy stable isotope analyses: $d^{13}C$ and $d^{15}N$ values of bulk collagen, as well as $d^{13}C$ isotope analyses of bone collagen single essential amino acids and ^{13}C values of bone bioapatite and tooth enamel (Halffman et al. 2020). Because the infants died before or shortly after birth, the isotopic values reflect maternal diets during pregnancy. In sum, Bayesian multisource mixing models indicated similar protein summer diets between the mothers of USR1 and USR2: mostly (62%–65%) terrestrial but significant (30%–32%) salmon and limited (5%–6%) freshwater resources (e.g., whitefish). Serial sampling of enamel from USR1 indicated that there was an increase in salmon consumption during summer versus spring, suggesting that overwinter storage of salmon did not occur (Halffman et al. 2020).

Importantly, hearth sediment isotopic analyses of multiple USR Component 3 hearths yielded corroborative results: averaging 53% terrestrial, 22% salmon, and 24% freshwater aquatic (waterfowl and freshwater fish) (Choy et al. 2016). Regional zooarchaeological analyses of Denali sites in the region provide a more comprehensive picture of USR paleodiets beyond the summer. Very large mammals are found at all Denali tradition sites with fauna (100% ubiquity), while small mammals (particularly ground squirrel and hare) are found at fewer sites (29% ubiquity) (Potter 2008a). Among large ungulates, bison and wapiti (56% and 31% ubiquity, respectively) are most common. Short-term Denali hunting camps, such as Gerstle River, are dominated by bison and wapiti, a narrow range of weapon technology, and low yield elements (Potter 2007). Denali residential base camps, such as USR and Broken Mammoth, have a wider range of faunal taxa (Potter et al. 2014; Yesner 2001). Collectively, these data suggest logistical mobility organization, with task-specific hunting parties bringing high meat-yield elements back to residential camps, where central place foraging likely took

place, including trapping/snaring local small game and fishing clear water sloughs for salmon.

Mortuary Behaviors at USR

Collectively, these data provide a rich background to understand mortuary behavior at the site (see Potter et al. 2014). In summer, perhaps late July and early August, a small band of hunter-gatherers occupied the USR site adjacent to a major braided river, where central place foraging took place. Locally captured salmon, ground squirrel, and hare were supplemented by bison and wapiti meat brought in from logistical spike camps located at some distance. Women, men, and children were all present at this residential base camp, for at least part of the time. Three residential features were occupied, probably short-term tent features each about 3 m in diameter, perhaps used by a nuclear family or closely related individuals. Spatial distribution of activities indicates heavy salmon processing in two of the residential features and outside a third, while terrestrial game processing occurred in other outdoor hearth areas (Choy et al. 2016) (Fig. 1). Lithic analyses indicate broadly similar lithic activities occurred across the site (e.g., biface thinning and tool maintenance on a few raw material types) (Potter et al. 2014). Figure 5 illustrates the sequence of events associated with the residential feature F2010-5, the central cooking hearth and the interment and cremation of the three individuals.

During the occupation, two infants from different mothers died closely together in time and were buried concurrently. They were carefully treated and interred in a pit below a central hearth of one of the residential features (Fig. 6). While no ochre fragments were found in the house floor or the central cooking hearth of this feature (F2010-5), the two other residential features (F2013-9, F2014-6) contained multiple clusters of ochre fragments (Fig. 7). None of the outdoor hearths contained ochre. This suggests multiple families took part in the burial ritual, processing the ochre for use in the burial. The two infants were coated with ochre, as fine ochre dust was present on all sides of the bones. A ~50-cm diameter pit with steep sides

(F2011-13) was excavated through the central cooking hearth of the residential feature (F2010-5), extending 40 to 50 cm below the hearth and 90 cm below the occupation surface. The flat bottom of the pit was covered with red ochre, about 30 cm in diameter, covering both infants and associated funerary objects. USR1 was laid near the western edge and USR2 was laid near the center. Four bi-beveled antler foreshafts, two with hafted bifacial projectile points, and a rhyolite unhafted biface (perhaps a preform) were placed in the center of the pit, adjacent to USR2 at roughly the same orientation (see below). All associated funerary objects were coated with ochre. Two small lithic flakes were also found in the pit, likely introduced during the interment excavation and backfilling. There was no charcoal or ash below the ochre layer, indicating no burning or other treatment of the burial pit before interment. A thin organic-rich layer less than 1 mm thick overlaid the infants and associated funerary objects, likely a vegetative mat (Potter et al. 2014). USR1 was supine, face up, with the knees tightly flexed toward the chest, left arm flexed across the chest with hand near the chin, and right arm extended across the torso to the left. USR2 is more difficult to ascertain given the more fragmentary state of the prenatal remains. She appears to have been placed upright with knees tightly flexed toward the chest, but sediment compression led to shifting of the torso prone over the legs, both of which were semi-disarticulated, with the left arm extended beside the back and behind the pelvis. The arrangements of the infants, the tight flexion, and presence of ochre coating on all sides of the bones suggest the two were wrapped in shrouds. USR1 and USR2 and the antler rods/points are all oriented parallel to each other between 8° and 360° (NNW), perpendicular to the dune crest, the alluvial terrace to the north and the Tanana River (all trending about 300°, WNW). USR1 was oriented with the head toward the river while USR2 was likely sitting facing the river (Potter et al. 2014).

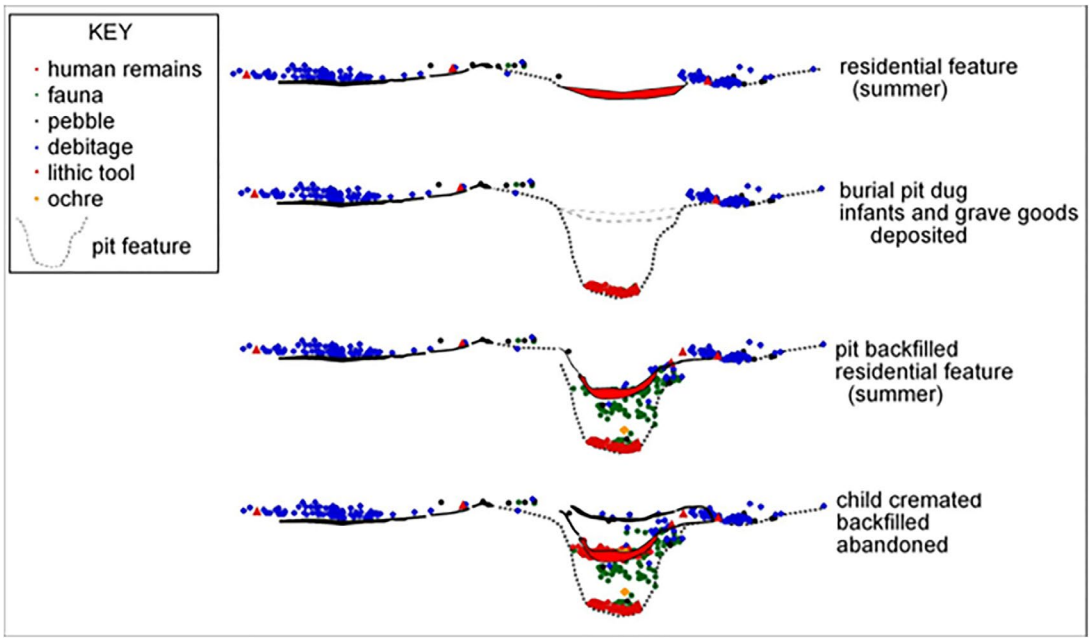

Figure 5. Sequence of events from earliest (top) to latest (bottom) associated with residential feature F2010-5 (black line), the central cooking hearth (red polygons), interment of USR1 and USR2, continued use of F2010-5, cremation of USR3, and abandonment. Backscatter plot shows three-pointed items east-west, with a view to grid north.

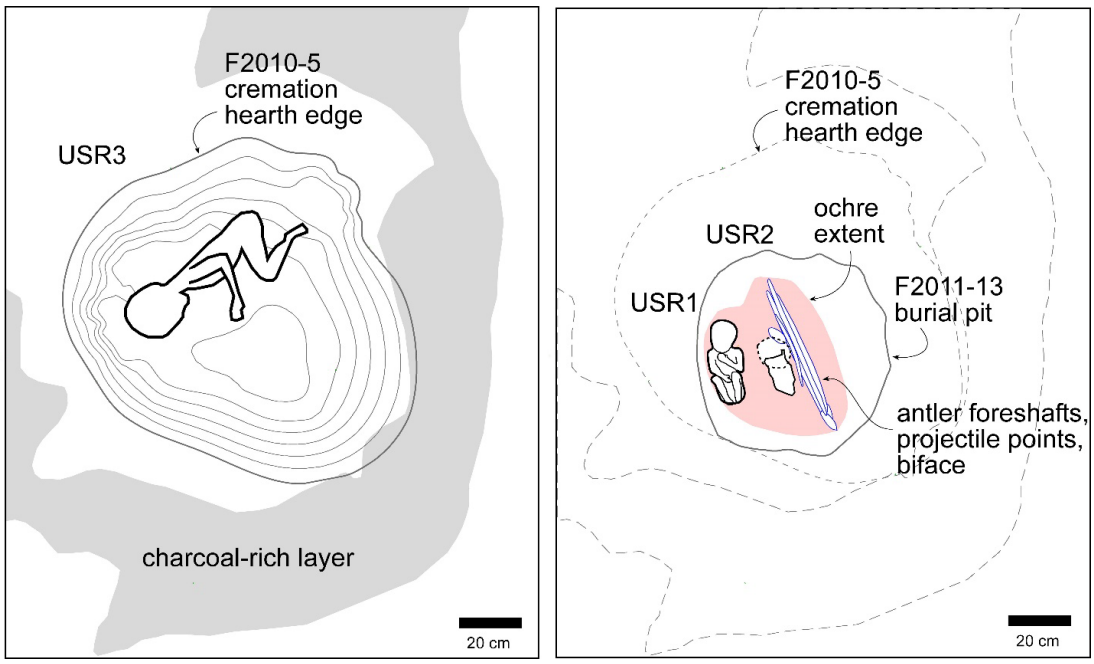

Figure 6. Plan views of cremation feature and underlying double infant burial. Cremation hearth bottom contours of 5 cm are shown along with charcoal-rich burn layer. USR2 shown with cranial fragment distribution (dotted line) and post-crania distribution (solid line).

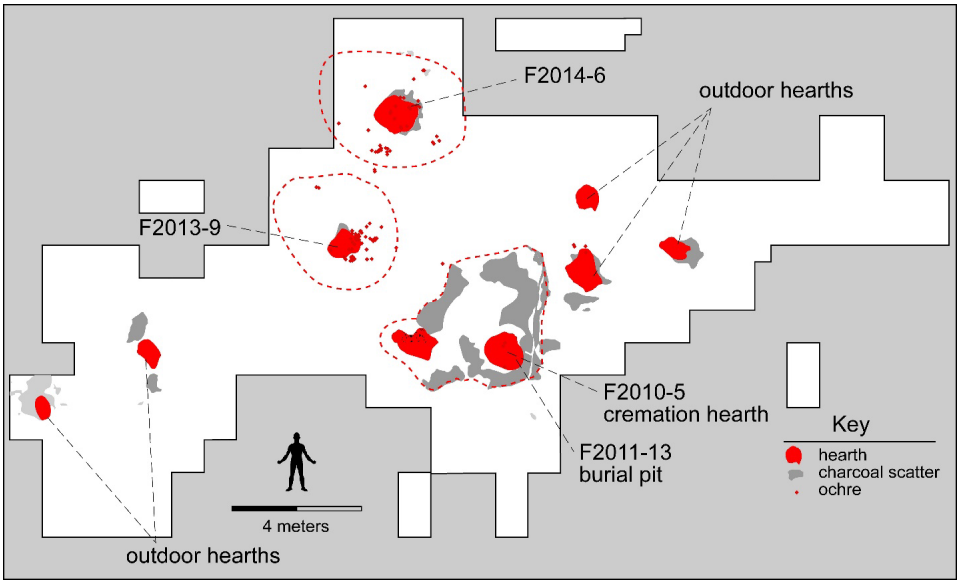

Figure 7. Location of ochre concentrations within Component 3.

The associated funerary objects consist of large mammal hunting weapon tips within atlatl-dart or spear systems (Fig. 8). Four bi-beveled wapiti-antler foreshafts (rods) have wear patterns consistent with hafting, and two have lithic points positioned in contact with the beveled ends, indicating they were hafted on placement in the burial pit. Three large rods (44.6–52.5 cm long, 1.6–1.8 cm wide, 1.1–1.2 cm thick) have multiple "X" patterns incised along their length, while the smaller rod (27.9 cm long, 1.5 cm wide, and 1.1 cm thick) did not contain incised decorations. These designs are unprecedented for known Paleoindian rods in the Americas. The two bifacial points are convex-based lanceolate in form and were made of basalt of moderate flaking quality. They are relatively large, 8.3–9.2 cm in length, 2.2–2.7 cm in width, and 0.88–0.92 cm in thickness. Both have intact tips and edge grinding extending from the base to over 50% of their total length. The rhyolite biface has no hafting wear and may represent a preform for a knife or other implement; it is similar in morphology to other non-projectile point bifaces within the component (Potter et al. 2014). Interestingly, all projectile points within the outdoor activity areas are highly fragmented, suggesting typical discard behaviors, whereas the bifacial points within the burial are in functional states.

Figure 8. Associated funerary objects of the USR double infant burial: two projectile points, a third biface, and four antler bi-beveled dart foreshafts (top and side-views). The two projectile points (58-87, 58-88) are positioned directly adjacent and above the bi-beveled antler foreshafts they were likely hafted with (58-83 and 58-85 respectively).

Following the interment of the infants, the pit was backfilled up to the central hearth, which was reestablished and used after the burial. Faunal analysis of materials scattered within the pit fill indicated the same suite of fauna in similar frequencies, suggesting a short period of time between the death and burial of the infants and the death and cremation of the three-year-old.

USR3 orientation can be inferred through heterogeneous burning of elements and three-dimensional spatial mapping (Potter et al. 2011). USR3 was likely supine with the body inclined somewhat to the right, on or near the hearth floor (Fig. 6). The position of the body likely shielded the back of the head from the hottest temperatures (Walker et al. 2008). The body was angled relative to the long axis of the dune and nearby Tanana River, head oriented

245°, SW, with no clear relationship to the Tanana River. The lower limbs were probably tightly flexed, given the proximity of the ribs near the edge of the pit. The anatomically in situ distribution of skeletal elements, transverse fracturing, and extensive warping of all fragments suggest soft tissue was present at the time of burning (Symes et al. 2015). The central hearth was about 10 to 11 cm thick, consisting of a thick oxidized layer with burned human and a few faunal remains overlying a ~2-cm-thick charcoal-rich layer, overlying an ashy layer containing numerous burned fish and small mammal bones, overlying a 4-cm-thick oxidized layer with abundant charcoal and some burned faunal remains. Spatial data indicate that human remains were above the burned fauna within the hearth, suggesting the USR3 cremation was the last use of the feature. Wood used in the cremation included *Populus balsamifera* (poplar). No associated funerary objects were associated with USR3; however, Paridae (small passerine) elements and a single avian, possible Picidae (woodpecker) element were found within the cremation hearth. These taxa are not typically used for food and are absent at all other Denali tradition sites and elsewhere at USR Component 3, so possibly suggest inclusion as part of the cremation ceremony. The pit was backfilled soon after interment and a large, thin burn layer dating to the same period as the hearth and burial pit suggests that the residential feature was abandoned and burned (Potter et al. 2011). Thus, burial treatment, positioning, and orientation were substantially different between the cremation and inhumations (Table 1).

Interpreting mortuary behaviors in the context of ideological systems within ancient cultures is fraught with difficulty, yet there are some elements that can be hypothesized for the USR materials. First, even though the reconstructed paleodiets and overall lifeways indicate some aspects of broad- spectrum foraging, with exploitation of large and small terrestrial mammals, salmon, freshwater fish, and terrestrial birds, along with a variety of berries, the focus of associated funerary objects was sacrifice of functional weapons geared for hunting

very large mammals. This may suggest that the importance of large mammals (particularly bison and wapiti) extends beyond the food and material they provide. Second, ochre was likely a symbolic element to rituals associated with the interment of the infants. Ochre was processed in two residential features (not the one associated with the burial), suggesting a communal activity among related individuals enabling participation in the burial process. Third, the association with hunting gear with two female infants is intriguing but should be carefully evaluated. We do not consider this to reflect a situation where females (contrary to Haas et al.'s [2020] interpretations of USR cultural practices) were involved differentially in hunting large mammals, and there is no evidence to support that contention (see below). We suggest it relates to sacrifices by the father or fathers of valuable (and decorated) hunting- related gear.

Table 1. Variability in mortuary behavior at USR.

Variable	*USR1 and USR2**	*USR 3***
Age at death	Infants (6 weeks, neonate)	3 year old
Sex	Females (n=2)	Unknown
Number of individuals	Multiple	Single
Position	Tightly flexed (USR1), indeterminate (USR2)	Supine, legs flexed
Orientation	8-360º, perpendicular to the dune, head towards the river	245 º, faced away from the river
Context	Pit excavated through cooking hearth	Within cooking hearth
Burning	Unburned	Cremated
Ochre	Both individuals, associated funerary objects, and bottom of pit covered with ochre	Absent
Associated funerary objects	2 bifacial projectile points hafted to bi-beveled antler foreshafts, two other antler foreshafts, biface (large game weapon toolkit)	Absent
Post-burial behavior	Backfilling of pit, post-burial occupation, continued use of hearth	Immediate backfilling of hearth, possible burning of residential feature, abandonment of site

* Data from Potter et al. 2014
** Data from Potter et al. 2011

USR provides direct evidence of complex mortuary behavior within a single ancient culture (Denali tradition) and even within a single occupation. Table 1 lists similarities and differences in mortuary treatment of all three individuals. We evaluated several hypotheses for the differences (Potter et al. 2014). Multiple cultural traditions or diachronic change within a

single tradition is ruled out, given the contemporaneous dating of the burials within the context of a single residential feature. The data on seasonality derived from pit fill fauna, cremation hearth fauna, and fauna in other Component 3 activity areas indicate a very short window of time for these burials to have occurred. They were probably used by the same small group of related individuals. Season of death may affect burial treatment (e.g., winter and difficulty in excavating into sediments vs. summer). Differential treatment is rejected given the abundant evidence for both burials and cremation occurring within a short period during the summer.

Hypotheses relating to culturally specific differences by sex or age grade (infants vs. three-year-olds) are difficult to evaluate, but there is evidence for variation in the treatment of newborns versus children in Gravettian sites in Europe (Zilhao 2005). This all may relate to Denali tradition perspectives on naming, ensoulment, or other culturally specific ideological factors that led to differential mortuary treatment of infants and three-year-olds. In this interpretation, at some point between six weeks and three years, Denali tradition children shifted from one category to another, suggesting differences in concepts of personhood. Given the presence of multiple child deaths within a single band in a short space of time, we could infer high infant/child mortality rates among Denali tradition peoples at the Pleistocene/Holocene transition. Such a shift in ontological categories could reflect a normative way to signal that the children are more likely to survive after they reach a certain age threshold. The addition of ochre and associated funerary objects for the youngest individuals could emphasize connections with existing or deceased adult relatives. If this is the case, perhaps adult Denali interments would be cremations without associated funerary objects. Without additional data, there is no rigorous avenue to test this hypothesis, though it remains an open one. There are no other known burials for the Denali tradition, which extends for thousands of years over much of eastern Beringia.

One plausible explanation for the mortuary treatment differences are situational factors at the site, such as individuals present at time of death and burial and overall mobility strategies practiced by Denali tradition hunter-gatherers. Evidence for logistical organization, particularly in the context of bison/wapiti hunting camps like Gerstle River, comprising short-term occupations dominated by hunting weapons and a narrow range of megafaunal prey and early stages of processing, and offsite removal of high meat-bearing elements (Potter 2005, 2007), suggests that males (father or fathers of the infants) may have been present during the burial of the infants and absent during the later cremation. Logistical short- term hunting camps in fall, like Gerstle River, suggest the fathers of the infants may have been absent in the later part of the Upward Sun River occupation, possibly affecting mortuary behaviors associated with the three-year-old cremation.

Another situational factor could relate to whether the deaths were expected or unexpected. Possible support could include the continued presence of the group after the infants' burial (perhaps expected) and subsequent abandonment of the site after the cremation (an older child). The latter death may have been considered unexpected and may have led to avoidance of the site. The high relative frequency of young Paleoindian individuals (USR1, USR2, USR3, Anzick) appears consistent with high levels of childhood mortality for mobile hunter-gatherers (Kelly and Todd 1988; Waguespack 2002, 2007; Walker et al. 2006). Of these interpretations, given the data, situational factors may be important; however, we cannot rule out different normative modes of treatment of infants versus older children by Denali tradition peoples discussed above.

Broader comparisons among USR burials and other Paleoindian and Northeast Asian burials are informative. Of children burials, USR and Anzick share the most similarities. Anzick is an 18-month-old male child associated with Clovis materials in Montana (Owsley and Hunt 2001). Both burials were of children, covered with red ochre, and sharing similar

associated funerary objects, consisting of functional tools (beveled rods interpreted to be dart foreshafts, projectile points, other lithics in both cases) rather than ornaments, suggesting that early Paleoindian groups did not practice obvious ranking or emphasize adornment. The similarities between USR and Anzick, the two securely dated burials of young children in the American record, could indicate similar importance of hunting within their respective societies: Denali tradition and Clovis complex, respectively. Other Paleoindian burials include red ochre and associated funerary objects, as well as interments in pits (Powell 2005). One difference is USR burial within a residential site. In this, USR is more similar to Ushki 1 level 6 in Kamchatka (western Beringia), where children were buried in pits within residential features (Dikov 1979; Goebel and Slobodin 1999). Other shared elements between USR and Ushki are location adjacent to large, braided rivers, salmon fishing, and common elements of material culture, including wedge-shaped microblade cores (Goebel and Slobodin 1999; West 1996). This may indicate elements of shared ideology between the Denali tradition in eastern Beringia and coterminous Diuktai culture in western Siberia. While no genetic analyses have been conducted on Ushki individuals to date, we expect them to be Ancient Beringians, as Diuktai culture is only replaced in Kamchatka later in the early Holocene (Dikov 1979).

USR mortuary treatment can be compared to the broader corpus of Paleoindian burials; however, genetic analyses indicate Ancient Beringians (and USR individuals) had been separated from other Native Americans for 8,000 years, suggesting any normative similarities may not be historically connected. Haas et al. (2020: table s6) lists 138 early (>7,000 cal yr BP) human remains sites in the Americas, including burials and non-burial contexts. Only four (4.8% of the 104 sites with secure contexts) are cremations; other than USR, all are adults, none have secure dates (Renier 1, Olive Branch, and Icehouse Bottom [n = 2]), and two have possibly associated hunting tools, but these associations are also not secure. The remaining 99

instances (95%) are described as burials. Of these, 13 (9.4%) are children within primary burials, and none have associated hunting tools. These do not provide secure evidence of widespread similarities in Paleoindian mortuary treatments, but it is interesting that there are no known Paleoindian child cremations other than the USR three-year-old and, conversely, no known Paleoindian infant burials other than the USR double burial. This suggests that in broader Paleoindian mortuary treatment, adult burials (not cremations) were the norm.

The USR burials have played into a recent argument for Paleoindian female hunting of megafauna. Haas et al. (2020), on the basis of only three secure female—hunting tool associations, two of which are the female infants at USR, argued for widespread and habitual Paleoindian big game hunting by females. We find this broad claim unconvincing, given the numerous empirical data sets (archaeological, ethnographic, bioanthropological, and physiological) that indicate the opposite (e.g., Capasso et al. 1999; Chatters 2011, 2014; Gurven and Hill 2009; Kelly 1983; Marlowe 2007; Murdock 1981; Murdock and Provost 1973; Oommen and Shanker 2021; Peterson 1998; Scabuzzo 2010; Waguespack 2005; Wood and Eagly 2002). The slightly larger sample Haas et al. (2020) use, 27 burials with less secure associations (of both sex and associated hunting tools), comes from multiple sites across two continents, representing a small subsample of 429 burials, 94% of which did not have evidence of female–hunting tool associations. Far more relevant data on sexual division of labor involve bioanthropological analyses of upper limb entheses to determine repetitive physical behaviors. In fact, bioanthropological data from Cuncaicha, ~300 km away from the only securely dated adult female with associated hunting tools (Wilamaya Patjxa), directly contradict that hypothesis (Karakostis et al. 2020). The key assumption is that deposition of hunting tools in a burial necessarily implies their use by that individual during life. In fact, USR (and Anzick) data confirm this is not necessarily the case. Associated funerary objects can be symbolic offerings

that contain meanings for the surviving members of the local community. We do not consider the mortuary association of hunting weapon technology at USR to indicate that females habitually hunted megafauna in eastern Beringia. However, we do consider that functional megafaunal weapon systems were sacrificed (i.e., interred) within an ancient Beringian economy focused on bison and wapiti (Potter 2007; Yesner 2001). This practice indicates the importance of megafaunal hunting within the ideology of Denali tradition peoples in interior Beringia.

Conclusions

USR has provided a wealth of information on ancient lifeways rarely recorded in the deep past of the Americas. Collaboration with our Alaska Native partners have allowed for the development of rich contextual data sets to better understand the three children buried at the site. Zooarchaeological, technological, feature, macrofossil, and biogeochemical analyses indicate a broad-spectrum foraging strategy, including small mammals and anadromous salmon use (among the earliest in the hemisphere), and complex division of labor, including the presence of logistically organized spike camps where large game underwent early stages of processing and were transported to residential sites like USR. Analyses of the human remains have so far focused on (1) paleodiet reconstruction, where they represent the first comprehensive paleodiet of Paleoindian individuals in the Americas, and (2) genetic affiliation; the three represent the first known members of a long-lived and major ancient metapopulation, Ancient Beringians, extending from ~19,000 years ago in Northeast Asia. Their ultimate fate is currently unknown, but they may have continued through amalgamation with incoming Dene peoples around 6,000 years ago (Moreno-Mayar et al. 2018; Potter 2023). Ongoing research includes analyses of lithic technological organization at USR and nearby contemporaneous sites, sedaDNA of hearth and activity area sediments to identify a wider

range of plants and animals used at USR, and ^{18}O and ^{87}Sr analyses to determine geographic locations and define mobility strategies of the mothers of USR1, USR2, and USR3, and all will shed new light on Denali tradition lifeways. The three burials represent significant windows into early Paleoindian behaviors, and despite the interpretive ambiguity, the mortuary behaviors relating to *Xaasaa Cheege Ts'eniin*, *Xach'itee'aanenh t'eede gay*, and *Yełkaanenh t'eede gay* at USR provide compelling evidence of rich and complex ideologies of ancient Native Americans.

Ethical Statement

Our research follows federal and state laws regarding antiquities and human remains and follows best ethical practices in consultation with Alaska Native stakeholders. Our USR research, and this article as part of that long-term research program, has been conducted with full cooperation of the local BIA-recognized tribe, Healy Lake Village (Mendas Cha'ag) and the regional Native Alaskan, nonprofit corporation, Tanana Chiefs Conference. We operate under a Memorandum of Agreement between all parties, including the lead federal agency, the National Science Foundation, the landowner, the State of Alaska, our research team, Healy Lake Tribe, and Tanana Chiefs Conference, which includes permission to publish results in scientific journals.

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