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An unusual Avonlea pit at Head-Smashed-In Buffalo Jump

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ABSTRACT

At the instigation of Jack Brink, a large pit feature situated in the processing area of Head-Smashed-In Buffalo Jump (DkPj-1) was excavated in 1992. Apparently made by enlarging an animal burrow, the irregularly shaped feature contained ochre-painted bison bones, bison mandible digging implements, large portions of a pottery vessel, projectile points, 17 sets of articulated bison bones, portions of 15 bison skulls, and almost 1000 identifiable faunal specimens, the vast majority being bison. Artifacts and radiocarbon dates between 1300 and 1050 cal BP indicate the feature is associated with Avonlea. In the absence of a functional interpretation relating to the processing of bison, a ceremonial/ritual purpose appears to be the best explanation for this unusual pit feature.

KEYWORDS

Head-Smashed-In, Avonlea, pit feature, bison bone, bison skull, pottery, digging tool, ochre, ceremonial, ritual

1. Introduction

Much of Jack Brink's fieldwork at Head-Smashed-in Buffalo Jump (HSI) centred on excavations in the processing area, beyond the cliffs and kill site for which the site is famous. With colleagues, Jack revealed aspects of the site not previously studied, including discrete activities represented by archaeological features such as hearths and pits. Like islands in a sea of undifferentiated midden covering the processing area at HSI, archaeological features provide the most tangible traces of specific activities and methods employed in processing bison, and most features are interpreted through that lens. Occasionally, a feature does not fit expectations and defies functional interpretation. This may reflect our limited understanding but, sometimes, alternative explanations seem more appropriate. In this paper I discuss one unusual pit feature, discovered due to Jack's best instincts. Large and irregular in shape, it contrasts with the basin shape of most features at HSI. While the contents are dominated by bison bones, they are less processed than usual and include a few elements from bison of exceptional size, including a skull. But it is the artifact assemblage that especially sets this pit apart. Unique bison mandible digging tools, ochre-painted bones, and large portions of a ceramic vessel were the first items deposited in the pit, pointing to a special significance in their manner of disposal. Dating to the Avonlea Phase/Horizon, this unusual pit constitutes a deliberate constellation of attributes that warrant detailed description and considered interpretation. This rare instance of tangible evidence of spiritual and ceremonial elements of communal bison hunting reminds us that:

> "to present only the western science-based explanation of how great buffalo kills worked would be to equate them to extraordinary technical achievements (which in fact they were). What is important is that they were so much more; they were interactions between deeply spiritual people and the world in which they lived" (Brink 2008:114).

1.1 Background

Archaeologists have long been drawn to bison jump sites on the Northern Plains. The ages and gender of hunted animals, their season of death, and initial butchering patterns can all be inferred from bones deposited at kill sites. Moreover, many bison jumps were reused over long stretches of time resulting in sometimes deeply stratified deposits. Coupled with abundant culturally diagnostic projectile points used to dispatch injured animals, bison jump kill sites offer unparalleled opportunities to understand communal bison-hunting practices through time (Frison 1970; Reher and Frison 1980; Brink 2008). Accordingly, initial, and subsequent, excavations at HSI have focused on the 11 metre-deep largely undisturbed layers of bone and artifacts below the sandstone cliffs over which bison had tumbled for thousands of years (Reeves 1978, 1983a; Brink et al. 1985:3-5; Kooyman 1990). These studies brought to light the outstanding importance of HSI leading to its designation as a UNESCO World Heritage site in 1981. But the site's significance is also grounded in the integrity of the entire site complex, including the gathering basin behind the cliffs, with its preserved drive lanes (Reeves 1978:154-155; Rollans 1987), and the extensive prairie in front of the kill site where bison parts were selectively brought for butchering and processing into a multitude of essential products and where social aspects of life would have been celebrated and refreshed (Figure 1).

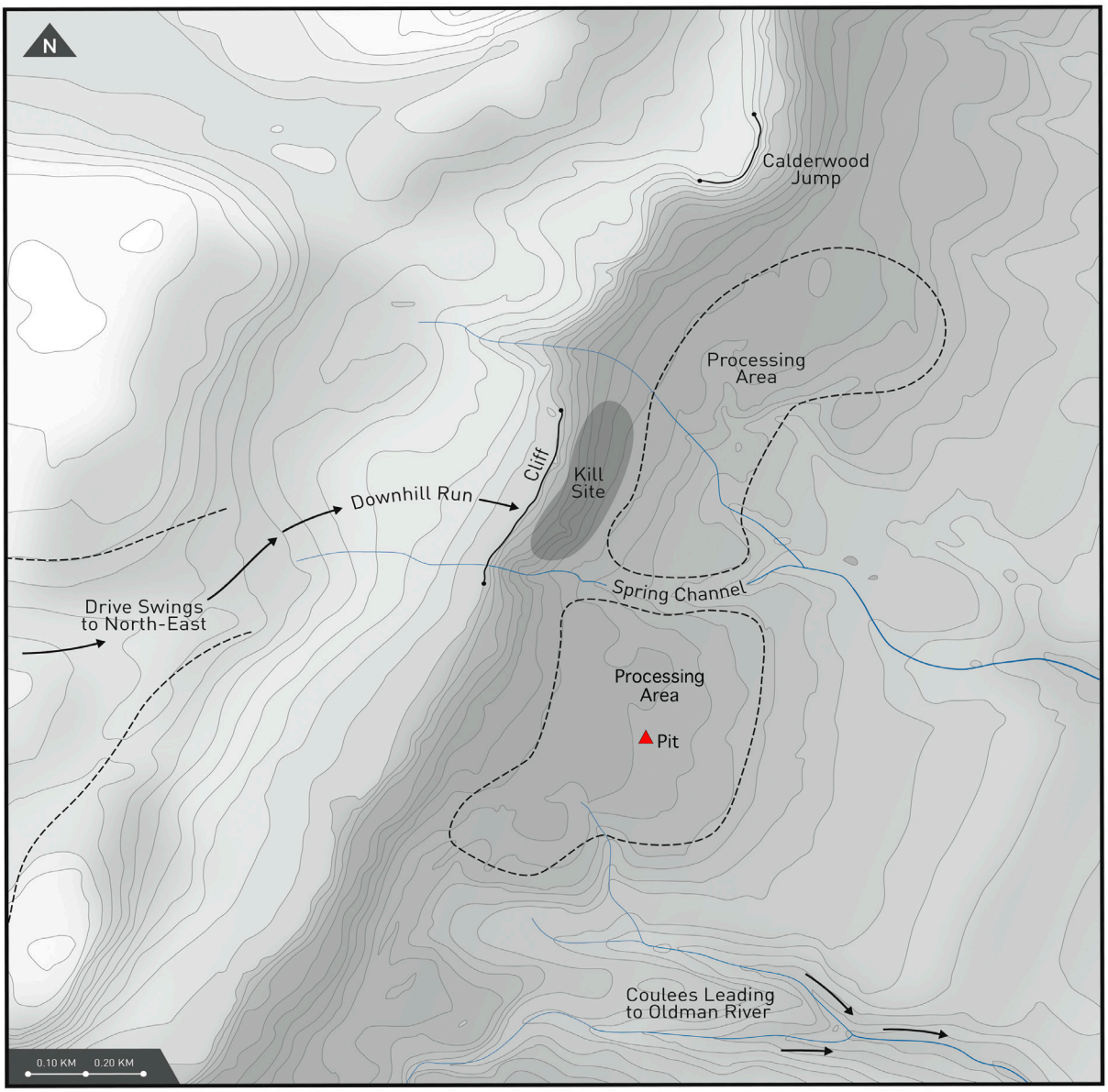

Figure 1. Schematic illustration of the main components of the Head-Smashed-In site complex showing location of pit feature 2b-1 (base map provided courtesy of the Royal Alberta Museum).

It was not until HSI interpretive facilities were planned by the Government of Alberta that significant archaeological attention turned to the processing area beginning in 1982 and continuing for the next ten years (Vickers 1983; Brink et al. 1985, 1986; Wright and Brink 1986; Brink and Dawe 1988, 1989; Dawe and Brink 1991; Damkjar 1995; see also Dawe et al., this volume). Excavations were intended to address potential disturbance from interpretive facility development but also to shed light on less well-known aspects of the site – "understanding of the processes and events associated with buffalo butchering and processing" (Brink et al. 1985:5).

While the processing area has been used for as long as the kill site, if not longer (see Bubel et al., this volume), it does not offer the same fine stratigraphic resolution, with most cultural deposits being less than a metre deep, often much less (cf. Bubel et al., this volume; Dawe et al., this volume), constituting a thin midden over the entire processing area. But what the processing area lacks in stratigraphy, it gains in resolution of discrete events and activities, particularly in the form of archaeological features like hearths, pits, and surficial concentrations of artifacts and bones. Features bring to life activities associated with bison kill events and camp life, complementing evidence from the kill site.

More than 80 archaeological features have been reported from about 250 square metres of formal excavation undertaken in the camp/processing area (Brink et al. 1985, 1986; Wright and Brink 1986; Brink and Dawe 1988, 1989; Dawe and Brink 1991; Damkjar 1995; see also Dawe et al., this volume). Just over half were deliberately excavated into the ground leaving a definable pit outline while others are surficial hearths or concentrations of bones, lithic debitage, and/or fire-broken-rock (FBR). Excavated (pit) features represent an archaeological moment in time resulting from purposeful action, recognizing that some would take time to infill and that contents do not necessarily reflect the function or age of the feature. Consequently, pit features are often inscrutable but we, nevertheless, infer possible or likely functions and use-scenarios based on formal characteristics and contents, informed by ethnohistoric accounts and functional context. In short, pits are a microcosm of archaeological sites.

Table 1 summarizes excavated pit features from HSI, with mean metrics for each functional type, adjusted for the fact that some were not fully excavated while others have not been described in detail. There is a preponderance of functional interpretations relating to food preparation including boiling, roasting, and generalized "cooking". "Volume" in Table 1 is simply a product of length, width and depth, which does not provide an accurate measure of volume given the sloping and irregular shapes of typical pits but offers a basis for relative comparison. Roasting and cooking features tend to be larger than the rest – with one exception. The last pit in Table 1 (Feature 2b-1) is significantly larger than other pits described from HSI and is distinctive in many other ways.

Table 1. Summary of excavated feature types from HSI with average dimensions (Brink, et al. 1985, 1986; Wright and Brink 1986; Brink and Dawe 1988, 1989; Dawe and Brink 1991; Damkjar 1995). * Bracketed number indicates frequency with reported dimensions. ** Nominal volume based on LxWxD (cm^3).

Frequency*	Function	Length (cm)	Width (cm)	Depth (cm)	Volume**
9 (7)	roasting	79	56	34	149
10 (3)	boiling	78	60	27	125
3 (2)	cooking	100	70	55	385
7 (7)	excav. hearth	67	59	12	47
2 (2)	FBR cache	39	38	22	32
1 (1)	ash	28	28	32	25
7 (3)	bone upright	15	16	24	6
4 (4)	unknown	47	39	21	38
1(1)	2b-1	100	70	120	840

2. Discovery and excavation

By the early 1990s, visitation to the HSI interpretive centre was growing steadily and improvements to roadway infrastructure were necessary, requiring further archaeological assessment and mitigative excavation, undertaken in 1991 and 1992 by ERD Heritage Consulting (Damkjar 1995). As this work was ending in 1992, Jack Brink asked if we could retrieve a bison skull that the late Blackfoot elder Leo Pard had spotted within an aborted animal burrow situated on the north edge of an old road alignment which was being converted to a new access road (Figure 2).

We began by enlarging the animal burrow, excavating about a metre down, intending to extract the skull, which was at about that depth. As we excavated, it became clear that other bison bones were associated, and we were likely dealing with a pit feature. To confirm this, we removed the 10 - 15 centimetre thick Ah-horizon (treated, nominally, as a 10 centimetre thick Level 1), revealing a pit in plan view, and we cleaned and expanded the exploratory excavation south of the pit to about 1.3 metres in depth to get an initial profile view (Figure 3) and facilitate access for subsequent excavation of Feature 2b-1. The overlying Ah-horizon (Level 1) yielded an assemblage of typical HSI artifacts (e.g., Brink et al. 1985, 1986; Brink and Dawe 1989), including five wedges, six bipolar cores, eight retouched and utilized flakes, an end scraper, a piece of brass, and two projectile points, one an edge fragment, the other a thick unifacial side-notched point most likely from the Old Women's Phase. None of these can be assumed to be associated with the feature. The deeper excavation south of the pit yielded a small sample of bones from what turned out to be the south edge of the pit.

Figure 2. Location of Feature 2b-1, looking north. The building in the left distance was the site of Brian Kooyman's kill site excavations in 1991 and 1992.

Figure 3. (a) Plan view of Feature 2b-1 following removal of Ah-horizon and (b) south profile view exposed by the exploratory excavation, revealing large and well-preserved bison bone. Skull at lower left was visible in the animal burrow that led to the feature's discovery.

As the animal burrow and our exploratory excavations had already disturbed and exposed the south margin of the pit, we established an east-west line through the narrow axis to create a south-facing profile exposure by removing the south half of the pit. Excavation proceeded in 10 centimetre levels. Before long, the abundance of bone made excavation difficult. Many elements were relatively large and intertwined, and numerous pieces extended well into the profile wall, so care had to be taken not to undermine or otherwise destroy the profile. Several bison skulls appeared beginning in Level 4, some of them very fragile (Figure 4). To determine the orientation and completeness of the skulls, they had to remain *in situ* while we excavated around them. The delicacy of this excavation was compounded by the fact that some of the skulls extended into the profile wall (Figure 5).

Figure 4. Plan view of south half of pit showing bison skulls at Level 8.

The recording procedure was to draw artifacts and identifiable bones in plan view and record 3-D provenience as they were removed; a variation on the methods used by Brink and Dawe (1989:42-49). Unidentifiable bone, FBR, and lithic debitage were bagged by quadrant and 10 centimetre level. All matrix was screened through 6.3 millimetre mesh.

Upon completing excavation of the south half of the pit, a second parallel east-west section was excavated 20 centimetres north of the first, to facilitate controlled removal of large bones extending into the first profile and to obtain an additional south-facing profile. Finally, excavation of the remaining north half of the pit was accomplished by hollowing out the pit (in 10 centimetre levels) to reveal its shape in negative relief (Figure 6).

Three-dimensional recording of identifiable bones and artifacts proved crucial to understanding the overall shape and extent of the pit since the matrix in the lower half could not be distinguished from the surrounding buff-coloured sediments. With about a thousand 3-D provenience points, we were able to create a rotatable three-dimensional scatterplot using Data Desk computer software, which allowed us to view a virtual profile of the pit in any orientation and to highlight specimens meeting specific criteria.

Figure 5. Profile view during excavation of south half of pit showing several bison skulls at Level 8. Note ground squirrel den in centre bottom of the profile.

Figure 6. Profile view following excavation of second east-west transect with excavation of the north half of the pit in progress. Note the large bones near the pit's surface along the north edge.

3. Feature description

The surface of the pit appeared as a dark slightly irregular oval stain, about 100 centimetres by 70 centimetres in size, contrasting with the surrounding buff sediments (Figure 3a). At the exposed surface, the dark pit matrix contained numerous bone fragments and FBR, typical of many HSI pits. As excavation began, bone preservation was fair to good but improved with increasing depth, eventually becoming excellent. At the same time, the dark pit matrix faded until, about 50 centimetres below surface, pit fill was indistinguishable from the surrounding matrix so pit edges were defined by the contents. As will be elaborated in the concluding section of this paper, the abrupt transition from dark matrix to buff-coloured matrix appears to represent two distinct depositional episodes of infilling of Feature 2b-1. It was also at this point that bone preservation improved dramatically – indeed, many bones looked fresh – and the feature widened in the east-west dimension (Figure 5). At 90 centimetres below surface, there was an abrupt narrowing of the pit, trending to the southwest, ending at about 120 centimetres below surface. With this peculiar asymmetry, the pit is best illustrated by a view of the excavation in progress (Figure 5) and by scatterplots of bone and artifact locations. In Figure 7, each dot represents a faunal or artifact specimen, some of them highlighted to distinguish different parts of the pit. Figure 8 shows plan drawings of each level. When viewed in sequence, they also show the peculiar shape of this pit as well as the changing densities of bone and FBR and the improved integrity of faunal specimens in the deeper levels.

The pit is predominantly conical in shape and oriented diagonally with the bottom being southwest relative to the surface. The main deviation from an overall slanting conical shape is a small eastward projection evident in Figure 7b between 50 and 90 centimetres below surface. This could be an area of animal disturbance, but it may, instead, be a deliberate part of the pit. With a depth of 115 centimetres, excavation would probably have required a person to be inside the feature to reach the bottom. This would be difficult in a deep conical pit but a small "step" about halfway down would serve the purpose well.

In addition to the open animal burrow, which led to the pit's discovery, removal of the Ah horizon suggested a history of animal disturbance in the vicinity of the pit – there were lenses of buff-coloured sediment interbedded with the usual dark Ah material. With the computerized scatterplots, we were able to show the effects of old animal burrows, some of which were also evident in the profile exposures

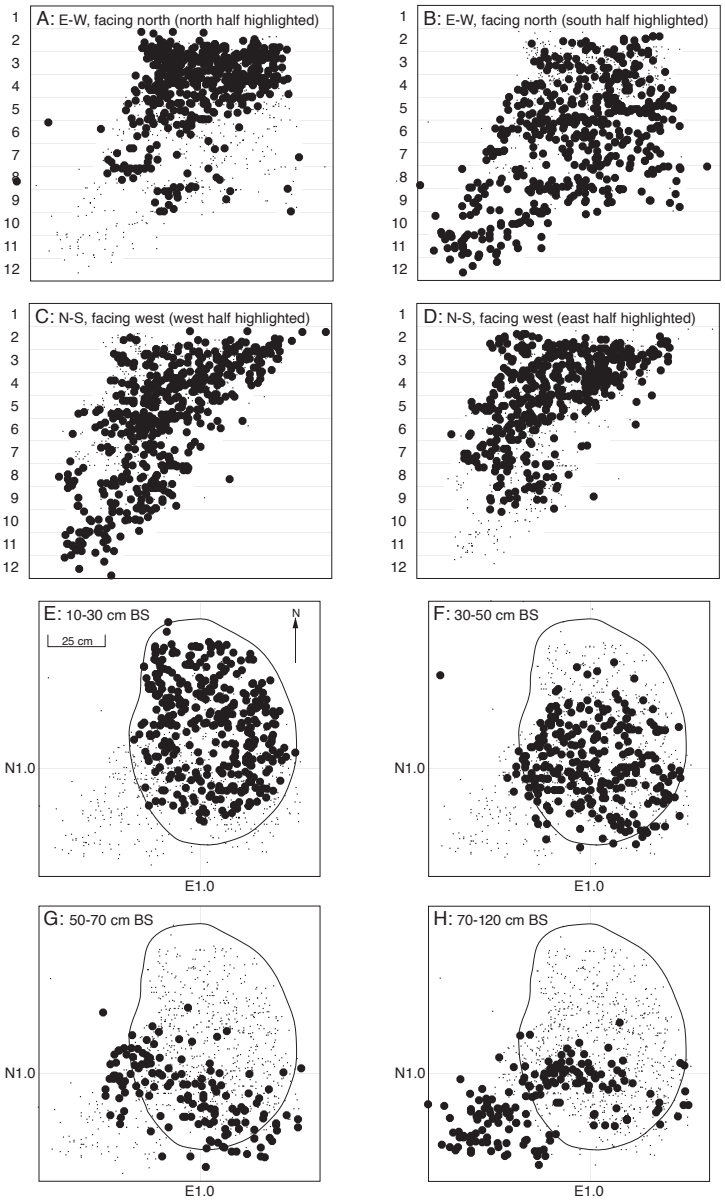

Figure 7. Scatter plots based on 3-D provenience of fauna and artifacts. (A-B) East-west profile views, looking north; (C-D) north-south profile views, looking west; (E-F) plan views at various depths. Surface pit outline is shown in the plan views. The y-axis in A-D are unit levels.

(Figures 9 and 10). Additional evidence of this burrowing was seen in a few outlying bones, an intrusive piece of glass, and a small dark lens, all either east or west of the inferred pit boundaries. More recent ground squirrel dens, still containing bedding material, were found at the bottom of the pit, more than a metre below surface, but it does not appear these caused much disturbance (Figure 5). Despite these attacks on the integrity of the feature, it was largely intact as is evident from the presence of 17 sets of articulated skeletal elements between Levels 3 and 10.

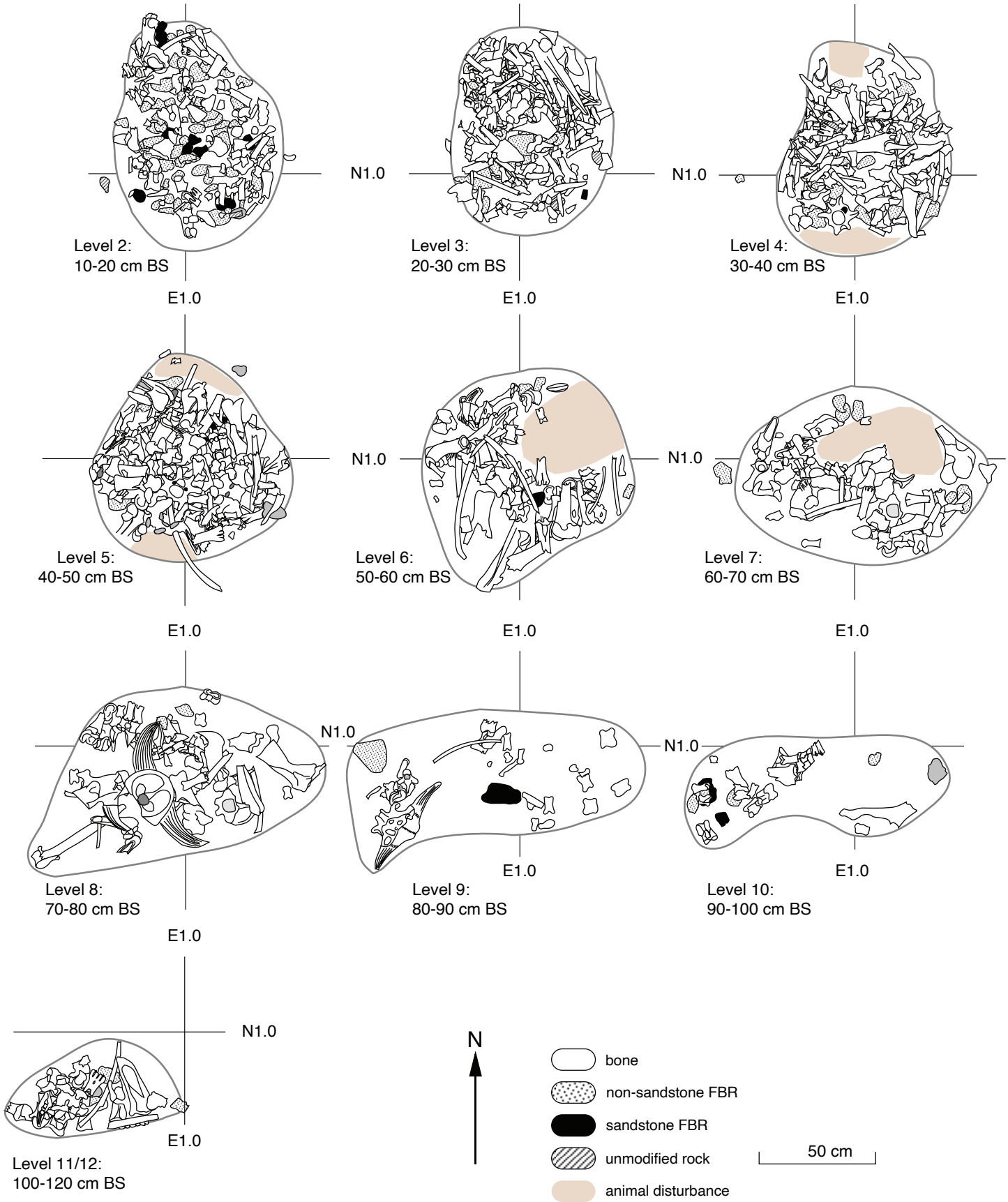

Figure 8. Plan view drawings at descending excavation levels in Feature 2b-1.

Figure 9. Partially completed excavation of the first east-west section, looking north. Disturbance from an animal burrow is evident cutting diagonally through the feature. Articulated bone units are present below the burrow on the west side, indicating these bones did not drop from above.

Figure 10. Partially completed excavation of the second east-west section, looking north. Disturbance from an animal burrow is evident cutting diagonally through the feature. Articulated bone units are present below the burrow on the west side, indicating these bones have not dropped from above.

Table 2. Summary of the contents of Feature 2b-1 by level.

Level	Artifacts (#)	Debitage (#)	Debitage (gm)	ID faunal (#)	ID faunal (gm)	ID faunal mean (gm)	Non-ID bone #	Non-ID bone (gm)	Burned bone (#)	Burned bone (gm)	FBR (#)	FBR (gm)
2	9	127	257.8	137	3865.3	28.2	3156	3331.0	24	18.8	218	12341
3	5	71	126.7	196	8684.4	44.3	1470	2401.8	19	15.6	127	6457
4	10	43	133.2	171	7592.4	44.4	1695	1900.4	17	22.3	86	4633
5	1	22	45.1	160	11280.6	70.5	1168	1481.9	12	3.3	41	3371
6	1	5	3.4	79	7758.2	98.2	532	507.0	10	13.3	21	2305
7	0	4	99.0	69	7387.2	107.1	199	468.6	6	4.4	15	2360
8	3	9	8.0	91	9062.6	99.6	354	220.6	14	6.4	11	705
9	4	2	0.8	35	3746.2	107.0	67	96.9	8	8.2	4	1340
10	2	1	0.4	26	1697.4	65.3	32	35.2	-	-	9	1780
11	9	-	-	11	1193.5	108.5	55	34.2	-	-	4	835
12	2	-	-	16	1823.0	113.9	3	1.9	-	-	-	-
Total	**46**	**284**	**674.4**	**991**	**64090.8**	**n/a**	**8731**	**10479.5**	**110**	**92.3**	**536**	**36127**

4. Feature contents

Contents of Feature 2b-1 are summarized in Table 2. Most items decrease in frequency with increasing depth. Some of this can be attributed to the narrowing dimensions of the pit below Level 8 but there is an inflection point around Level 5, beneath which identifiable faunal specimens are considerably larger and less densely packed together, compared with upper levels. Other categories of contents, such as debitage, unidentified bone, and FBR, are significantly more abundant above Level 5. As noted previously, this abrupt change appears to represent two distinct depositional episodes, as will be elaborated upon later.

4.1 Artifacts

The 46 formal artifacts recovered from Feature 2b-1 do not follow the pattern of gradual decrease in frequency with increasing depth. Rather, they are concentrated in two areas: the upper levels (2 to 4) and the lower levels (8 to 12), with only a few artifacts in the intervening levels (Table 2). The dichotomy and spatial separation between "upper" and "lower" artifacts is evident in Figure 11 which is a northeast-southwest scatterplot profile with "upper" and "lower" artifacts highlighted. Clearly, there is a group of artifacts mixed with the upper pit fill and a second group resting on the sloping bottom of the pit. The upper group is a typical selection of lithic artifacts, including four projectile points, along with four small pottery fragments, while the lower artifacts include a single quartz core, 15 pottery fragments (of a single large vessel), two ochre-covered bison bones, and a pair of modified bison mandibles (Table 3). Only selected artifacts are described in the sections below.

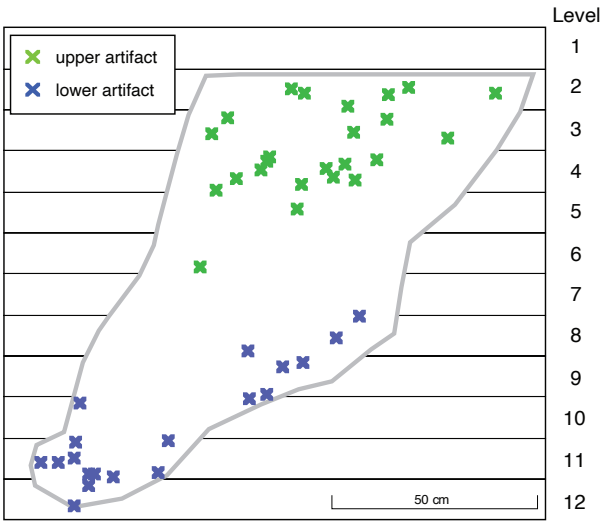

Figure 11. Northeast-southwest scatterplot of Feature 2b-1 artifacts showing spatial distinction between "upper" and "lower" artifacts.

Table 3. Feature 2b-1 artifact frequencies by level.

Level	2	3	4	5	6	7	8	9	10	11	12	Total
Projectile point	1	2	1	-	-	-	-	-	-	-	-	4
Biface	-	-	2	-	-	-	-	-	-	-	-	2
Endscarper	1	-	-	-	-	-	-	-	-	-	-	1
Sidescraper	-	1	-	-	-	-	-	-	-	-	-	1
Graver	1	-	-	-	-	-	-	-	-	-	-	1
Wedge	2	-	-	-	-	-	-	-	-	-	-	2
Bipolar core	1	-	2	-	-	-	-	-	-	-	-	3
Core/chopper	-	-	-	-	1	-	-	-	-	-	-	1
Core/chopper	-	-	-	-	-	-	-	-	-	1	-	1
Retouched flake	2	-	2	1	-	-	-	-	-	-	-	5
Utilized flake	2	2	-	-	-	-	-	-	-	-	-	4
Abrader	-	-	1	-	-	-	-	-	-	-	-	1
Ochre bone	-	-	-	-	-	-	-	-	1	1	-	2
Mod. mandible	-	-	-	-	-	-	-	-	-	-	2	2
Pottery sherd	2	-	2	-	-	-	3	4	1	7	-	19
Total	**12**	**5**	**10**	**1**	**1**	**0**	**3**	**4**	**2**	**9**	**2**	**49**

4.1.1 Projectile points

Four projectile points were found in Levels 2 to 4 (between 13 and 36 centimetres below surface), including one complete specimen, one missing the tip, and two tip fragments (Figure 12). The two with intact bases are of the Timber Ridge Side Notched variety commonly associated with Avonlea although, with neck widths of (a) 10.0 millimetres and (b) 7.7 millimetres, they are very small, the latter falling within the size range of apparent toy arrowheads from HSI (Dawe 1997). However, this small specimen is remarkable for its skilled manufacture, in contrast with the generally poor craftsmanship noted in "toy" arrowheads (Dawe 1997). Indeed, all the specimens recovered from Feature 2b-1 display thinness and fine flaking typical of Avonlea points.

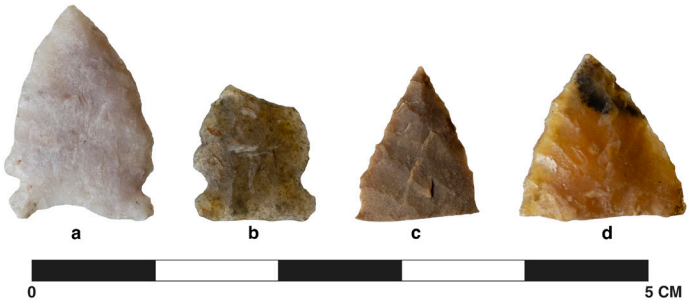

Figure 12. Projectile points from Feature 2b-1. Specimens "a" and "b" are Avonlea Timber Ridge varieties while "c" and "d" display fine flaking typical of Avonlea projectile points.

4.1.2 Ceramics

Nineteen pieces of clay pottery were recovered. Fifteen mostly large sherds from a single vessel, were found resting on the slanting bottom of the pit between Levels 8 and 12 (Figure 13) while four small sherds were found in Levels 2 and 4. At least one of the four small sherds in the upper levels displays surface treatment, paste, temper, and thickness similar to the lower sherds. Though a refit attempt with lower sherds was not successful, this sherd implies possible contemporaneity between upper and lower artifact concentrations. Two of the other "upper" sherds are of a similar type (in terms of surface treatment) but appear to be from different vessels. The fourth sherd is too small for analysis. Several of the large sherds at the bottom of the pit are carbon-encrusted, especially on the exterior and along some of the breaks, indicating the vessel was broken and exposed to fire prior to deposition in the pit. The discovery of 15 or 16 sherds, some of them quite large, from a single vessel is unusual at HSI and, indeed, in Alberta. I therefore offer a detailed description of this vessel.

Twelve of the sherds conjoin to form three large pot sections: two rim portions and a vessel base. Although these three sections do not join, they are clearly from the same vessel. The largest rim section consists of four fragments with overall dimensions of 18 by 21 centimetres, including 12 centimetres of intact lip (Figure 14). The smaller rim is composed of three pieces with 7.5 centimetres of intact lip. The largest portion of the pot is the base, which is made up of five sherds that, together, measure 21 by 25 centimetres (Figure 15).

Figure 13. Photograph of the lowermost pottery sherds *in situ*, Level 11, Feature 2b-1.

Figure 14. Reconstructed large rim portion of pottery vessel from lower part of Feature 2b-1.

Figure 15. Reconstructed sections of pottery vessel from lower part of Feature 2b-1 in approximate relative position. Photograph courtesy of Royal Alberta Museum, with modification.

The vessel rim has a near-vertical orientation, slightly in-sloping in the top few centimetres. The lip is rounded and undecorated. Although the overall interior rim profile is concave, there are small areas of straight or slightly convex contour. The upper six centimetres of the interior has pieces of temper protruding, corresponding with an area of exterior decoration, and suggests that a soft anvil (perhaps fingers, as there are very slight horizontal ridges/depressions) was held inside while the exterior decoration was applied. Small striations are visible on the interior at various orientations but predominantly parallel to the rim. The exterior profile of the rim is convex. Exterior decoration begins 8 to 15 millimetres below the lip and consists of four horizontal rows of small vertical finger pinches with a row of widely spaced punctates below that. The four rows of finger pinches together form a 38 to 46 millimetre-wide band around the rim. Individual finger pinches are small four-sided pyramids ending in rounded points. They average 9.2 millimetres in width, 9.5 millimetres in height, and protrude two to three millimetres from the original surface. Depressions between pinches (within a row) are curved (convex to the left) with a ridge along the left margin, presumably a fingernail impression – these are about 8 millimetres long (vertically) and 1.5 to 2.0 millimetres wide. Rim thickness increases from about 11.0 millimetres just below the lip, to 13.0 to 14.1 millimetres at the first row of finger pinches, and 14.2 to 17.3 millimetres at the fourth row. Below the finger pinches, the body is 14 to 15 millimetres thick. A few millimetres below the finger pinches (56 to 59 millimetres below the lip) is a row of widely spaced (30 to 34 millimetres apart) slightly oval punctates, six millimetres in diameter and four millimetres deep with a conical profile oriented perpendicular to the sur-

face. The rest of the pot exterior is covered with coarse net or fabric impressions, likely reflecting construction within a net or fabric bag. After the clay was quite dry, the surface was rubbed to remove raised areas leaving what Byrne (1973) calls a "truncated fabric impression." Striations from this rubbing are generally vertically oriented and there is a burnished appearance. The amount of truncation varies considerably over the body of the vessel from very minimal in places where the surface contour is slightly concave to heavy where the surface is especially convex (assuming these latter areas were originally as fully impressed) – this effectively evened out imperfections in the contours of the vessel body. Truncation is also minimal or absent in the upper 30 millimetres (of fabric impression), which overlaps the lower pinches and punctates indicating the rim decorations were applied after fabric impression but prior to truncation. A ca. 5 centimetre area on the bottom of the pot has been repeatedly impressed at various orientations and received little or no truncation. Due to the truncation and overlapping net/fabric impressions, it is difficult to make out the exact nature of the net/fabric but, generally, there is a vertical orientation to the markings. Vertical rows of cord markings are three to seven millimetres apart and the cord used appears to have been two to three millimetres in thickness – probably indicative of a fine net. Walde et al. (2010:150) have examined the vessel and were able to "see details of the bag in which the vessel was constructed, including an area where the top of the bag was folded over the side of the pot and pressed into the clay surface". Otherwise, the interior of the pot is quite smooth with only slight depressions and faint striations, both having a horizontal orientation attributable to use of an anvil during manufacture.

Horizontal coil breaks are apparent on several sherds representing imperfect joins between strips of clay. Although no actual mends could be made along coil breaks (when reconstructing sections of the pot), the method of manufacture is apparent. Adjacent "tongues" of clay were joined by having the upper one extend down behind the lower one. The resulting break leaves a concave channel visible from the exterior of the upper portion of the broken seam, and a mirror image on the bottom portion. Although the body of the vessel tends to be 14 to 15 millimetres thick, there is a thinning to as little as 11 millimetres just above each coil break, evidently a result of squeezing the clay and pulling it down on the inside to secure the seam. Similar horizontal bands of thinning occur about every seven centimetres down the body indicating that the vessel was made by joining seven centimetre wide strips of clay.

Although no physical mend was made between the base and either of the rim pieces, one of the basal pieces has a coil break which is a close match with a coil break on the larger rim piece. If these are complementary halves of the same break, the pot would be 37 centimetres from the centre of the base to the lip, measured along the exterior surface. Such a match is assumed in the reconstructed profile in Figure 16. Based on this reconstruction, the pot had a conoidal shape, stood 32 centimetres high and had an opening about 25 centimetres in diameter, which matches well with the curvature of the rim fragments.

Of the three small sherds from Feature 2b-1 that are not attributable to this vessel, one is similarly truncated net/fabric impressed but only 8.2 millimetres thick, one has smoothed fabric or cord markings and is 11.2 millimetres thick, and the third is unanalysable.

In most respects, the pot fits Byrne's criteria for a Period I (i.e., early) Saskatchewan Basin Complex vessel, which is associated with Avonlea (Byrne 1973:347). Of the attributes present on this pot, only surface truncation is found by Byrne (1973:349) to be restricted to the later Periods II and III.

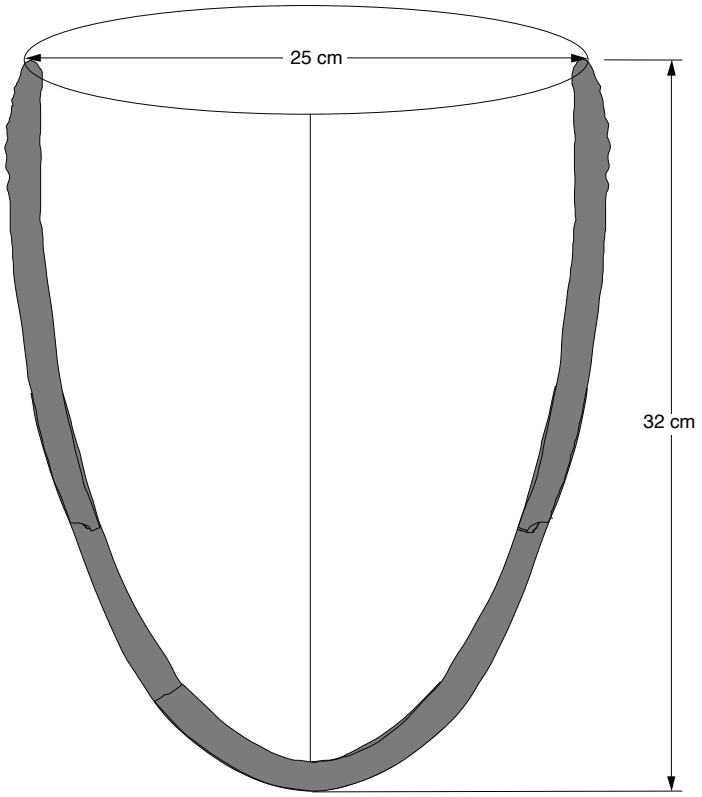

Figure 16. Reconstructed profile drawing of large pottery vessel from Feature 2b-1.

A more recent review of Alberta ceramics by Walde et al. (2010) is a follow-up to a Meyer and Walde (2009) review of Northern Plains Avonlea pottery in which they propose that the widespread Avonlea Phase, championed by Reeves (1983b) and adopted by most Plains archaeologists, be reconsidered an Horizon with regional phases distinguished by differences in ceramics. The vessel described here is an example of Rock Lake Net/Fabric Impressed Ware, which is "found throughout a very large area extending from the Eastern Woodlands through to central Minnesota and northwest to southern Alberta" (Walde et al. 2010:148). Alberta examples are frequently decorated, beyond the net/fabric impressions, as is the case here. They suggest occupations with such pottery in Alberta be considered manifestations of the Morkin Phase of the Avonlea Horizon. It's not yet evident whether this proposed taxonomic adjustment to Avonlea will be widely adopted (cf. Peck 2011:365-366).

4.1.3 Ochre-covered bones (n=2)

Two bones with red ochre markings were recovered from the bottom of the pit, both with deliberate designs applied (Figure 17). An otherwise unmodified proximal bison phalanx has been painted over its dorsal surface and also has two bands of ochre along the lateral margins of the ventral surface (Figure 18). The distal articular end is painted while the proximal end is not. The bone measures 62.8 millimetres long, 34.0 millimetres wide, and 35.2 millimetres thick. Nearby, a left bison tibia shaft fragment has at least three transverse bands of ochre, as well as a light ochre undercoating, on the exterior surface (Figure 19). Ochre does not occur on the fractured edges of the bone or the interior surface. This specimen is 129.9 millimetres long, 44.0 millimetres wide, and 27.7 millimetres thick. It is tempting to interpret the two objects from Feature 2b-1 as having some symbolic significance in their depositional context.

4.1.4 Spatulate objects (n=2)

Also found at the bottom of Feature 2b-1 are two right bison mandibles modified into spatulate tools (Figure 20). In both cases, the ramus has been cut away leaving a flat rounded posterior end. The resulting artifacts are 316.5 millimetres and 246.0 millimetres in length, 75.0 millimetres and 77.1 millimetres in width, and 28.5 millimetres and 24.2 millimetres in thickness, respectively. The anterior ends are roughly pointed, having been splintered from end impact. The premolars and molars appear to have been deliberately smashed, leaving small nubbins, which are, on the larger specimen, rounded from abrasion. The smaller specimen is from an immature animal with Ml barely erupted and the developing M2 just visible through a small opening behind Ml. A probable age for this animal is about five to six months

Figure 17. Ochre-painted bison phalange *in situ*, Feature 2b-1.

Figure 18. Ochre-painted bison proximal phalange from Feature 2b-1 showing (a) dorsal and (b) ventral views.

Figure 19. Ochre-painted left tibia shaft fragment from Feature 2b-1.

Figure 20. Modified bison mandible spatulate digging tools from Feature 2b-1.

(Frison and Reher 1970; Frison et al. 1976; Frison 1982). If born in late April, early May, during the peak calving season (Frison et al. 1976), this specimen suggests a fall season of death, bearing in mind the artifact may have been curated for an unknown period. The larger specimen is adult but, with the teeth smashed, no specific age group can be suggested.

The smaller specimen has longitudinal striations on the buccal or lateral surface, below the teeth, while the larger specimen, which is better preserved, has longitudinal striations on the medial surface at the posterior spatulate end – the striations may be from use-wear. The latter specimen also has substantial use polish, especially around the central body of the mandible. The form, apparent use wear, and depositional context of these artifacts suggests they served as hand-held digging implements to excavate the large pit in which they were found. Although the matrix at HSI is extremely hard when dry, if rain-soaked, as it was in the summer of 1992, it becomes relatively soft and could easily be excavated with such tools. These seem to be unique artifacts, at this point, so the discovery of similar tools elsewhere could be very informative.

4.1.5 Debitage

Lithic debitage parallels the vertical distribution of other lithic artifacts with 93% of the 284 pieces being found in the upper four levels (2 to 5). It is a quite typical HSI assemblage, dominated by chert, Swan River Chert, quartzite, silicified sediments, and argillite.

4.1.6 Fire-broken rock

Feature 2b-1 yielded 536 pieces of fire-broken rock weighing over 36 kilograms, the vast majority being non-sandstone. The first four levels (2 to 5) contain 88% of the total, or 74% by weight. FBR in the lower levels tends to be larger. Nevertheless, there is no obvious functional relationship with the pit. Other large HSI features have the majority of FBR at the base of the pit in an apparent food processing context (Brink and Dawe 1989). Like debitage, FBR appears to be an incidental inclusion, primarily in the upper pit fill.

4.2 Faunal remains

More identifiable faunal specimens were recovered from this pit than from 58.5 square metres of 1991/92 block excavations in the processing area – 991 elements weighing 64 kilograms were identified as bison elements in Feature 2b-1. While the number of bones per level generally decreases with depth, this pattern is somewhat countered by increasing average bone weight, from 28.2 grams in Level 2 to 113.9 grams in Level 12 (Figure 21). The larger bone size in the lower levels is due to better preservation, less fragmentation (preservation aside), and the presence of some large elements, notably several skulls, most prominently in Level 8.

In addition to identifiable bone, there are 8731 unidentifiable pieces (10.5 kilograms), which is proportionally much less than typically found in excavations. The weight ratio of identified to unidentified bone in the pit is 6.1 to 1 while in the 1991/92 excavation blocks it never exceeds 1.5 to 1.

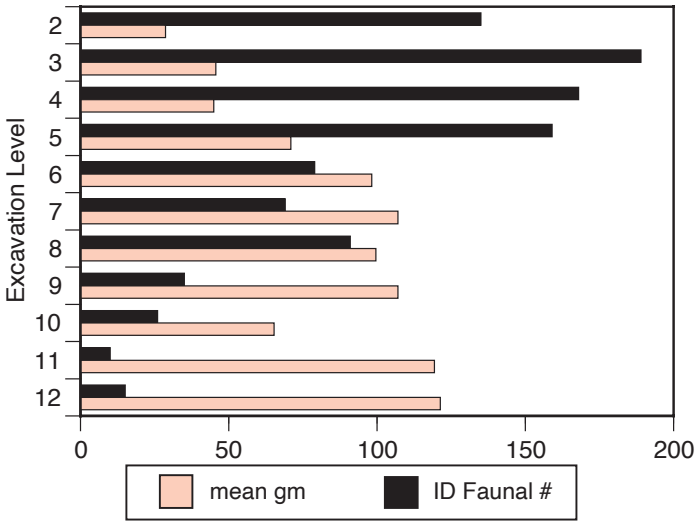

Figure 21. Bar graph illustrating decreasing number and increasing size of identifiable faunal specimens with increasing depth in Feature 2b-1.

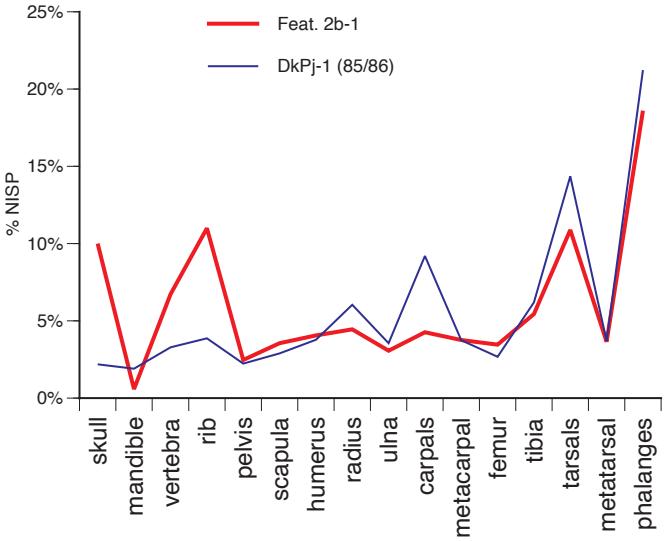

Figure 22. Comparison of %NISP for major skeletal elements from Feature 2b-1 and DkPj-1 1985/86 block excavations (Brink and Dawe 1989).

Table 4 provides number of identified specimen (NISP) values for the main bison skeletal elements by level while Figure 22 plots the %NISP of Feature 2b-1 in comparison with the 1985-1986 block excavations at HSI (Brink and Dawe 1989). Notable differences are the high values for skull, vertebrae, and ribs and somewhat low values for mandible, radius, carpals, tarsals, and phalanges in Feature 2b-1. Some of this is probably a reflection of superior preservation in the feature. Skull, vertebrae, and ribs are certainly present in block excavations but are usually fragmented beyond an identifiable state. Carpals, tarsals, and phalanges are well preserved almost everywhere at HSI - their low relative frequencies in the pit are (at least partially) due to the higher than usual identifiability of other elements.

Skulls are particularly abundant in Levels 8 and 11. Vertebrae and ribs are decidedly more common in the upper half of the pit while the radius, and (less consistently) carpals, tarsals, and phalanges are more common in lower levels. This latter pattern is due partly to the presence of articulated joints, consisting of several individual elements, and relatively few other elements. A high tarsal frequency in Level 9 is a result of a cluster of six astragali. Indeed, astragali have clearly been selectively included in Feature 2b-1, especially in Levels 9 to 11 where they comprise 13% to 22% of the faunal elements. In total, 57 astragali came from Feature 2b-1. With a minimum animal unit (MAU) value of 26.5, astragali are more than three times as common as any other element (i.e., adjusting for the number of times each element occurs in the body). This is a phenomenon seen previously in another large pit feature at DkPj-1 (see Brink and Dawe 1989:110) and observed in non-pit contexts at the Late Precontact Saamis site in Medicine Hat, Alberta (Congram 1978:Plates 29-31).

Table 4. Feature 2b-1 NISP for major bison elements by excavation level.

Level	Skull	Mandible	Vertebra	Rib	Pelvis	Scapula	Humerus	Radius	Ulna	Carpals	Metacarpal	Femur	Tibia	Tarsals	Metatarsal	Phalanges	Total
2	11	0	8	14	7	3	6	7	7	4	6	5	6	10	5	22	121
3	3	1	12	24	5	7	8	7	6	13	10	7	20	24	7	28	182
4	12	1	17	25	8	4	3	7	1	3	3	10	14	14	8	30	160
5	20	0	11	21	2	5	9	9	8	6	8	5	3	16	4	25	152
6	10	2	5	8	2	5	7	3	3	1	4	5	1	6	4	10	76
7	8	1	2	9	0	6	1	3	1	0	1	2	6	11	4	14	69
8	25	1	3	4	0	3	3	2	2	5	3	0	0	5	2	27	85
9	2	0	1	2	1	0	0	0	1	1	1	0	1	13	0	9	32
10	1	0	1	0	0	0	0	4	1	7	0	0	1	3	0	7	25
11	2	0	1	0	0	0	1	0	0	0	1	0	1	2	0	2	10
12	0	0	2	1	0	1	1	3	0	0	0	0	2	1	2	2	15
Total	**94**	**6**	**63**	**108**	**25**	**34**	**39**	**45**	**30**	**40**	**37**	**34**	**55**	**105**	**36**	**176**	**927**

4.2.1 Bison skulls

Portions of 15 bison skulls were identified, most occurring between Levels 5 and 8. Table 5 indicates the amount (in grams) of identified bone associated with each skull but it should be noted that small identifiable but unassociated cranial fragments are not included. In all, 13.2 kilograms of identifiable skull bones were found, the 15 skulls accounting for 11.4 kilograms of this. The basioccipital is most represented (12 skulls) while the calvarium is partially intact on eight skulls. Two skulls include only maxillae.

Assigning a specific level to the skulls was somewhat arbitrary since the larger ones extended over as much as 30 centimetres of depth. Level assignment in Table 5 refers to the surface the specimen appeared to be resting on. At around Level 7, three of the most complete skulls (4, 5, and 6), all oriented similarly with the foramen magnum pointing up and the top of the skull facing approximately east, seemed arranged in a row and dominated the excavation floor (Figures 4 and 5). The centre skull (5) is from a particularly large individual. It is incomplete but has a horn core spread of roughly 66 centimetres, placing it near the maximum for modern plains bison (Wilson 1983:9-10), though it would have been slightly closer to the norm 1250 years ago when the animal is presumed to have died (Frison 1978:282). Other skulls did not share the orientation of these three and what seemed like deliberate placement may simply be coincidence. We cannot rule out that another large skull portion (8) has moved as a result of animal disturbance and once shared an orientation and depth with skulls 4, 5, and 6. Figure 23 illustrates all of the skulls in a vertically collapsed plan view.

Table 5. Summary of bison skull data from Feature 2b-1. * max = maxilla, b-o = basioccipital, calv = calvarium.

Skull #	Level	Part *	gm
2	4	max	248.9
9	4 to 5	b-o/calv	627.7
11	5	b-o	463.3
1	5	b-o/calv	707.3
14	5	max (calf)	103.6
4	5 to 6	b-o/calv	1559.7
10	5 to 6	b-o/calv	637.2
7	6	b-o	132
3	6	b-o	108.3
15	6	calv (feotal)	66
12	7	b-o	180.9
5	8	b-o/calv/max	3618.6
6	8	b-o/calv	863
13	8	b-o	89.1
8	9 to 11	b-o/calv	2013.7

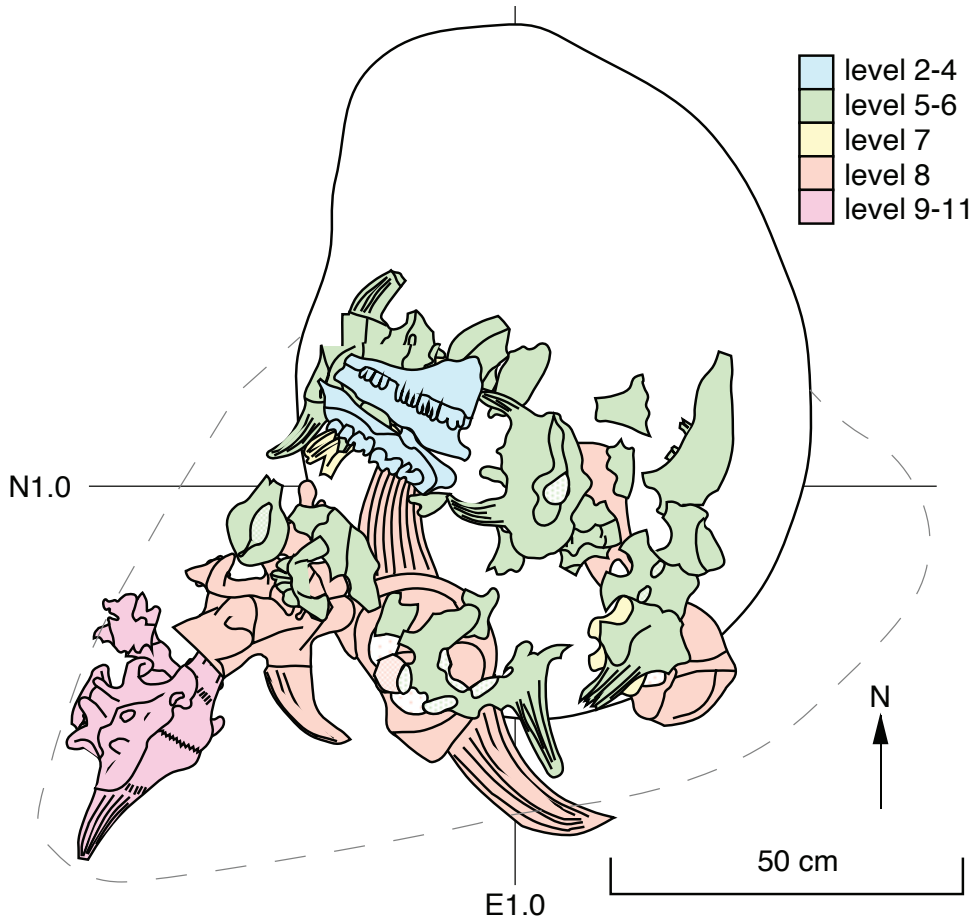

Figure 23. Composite plan view drawing of skulls in Feature 2b-1. Surface pit outline and approximate subsurface extent (dashed line) are indicated.

4.2.2 Bone articulations

Seventeen sets of articulated bones were found between Levels 3 and 10 as summarized in Table 6. They include two small cervical sections, one elbow joint, two articulated proximal radii and ulnas (grouped together), three carpal joints, two front hooves, four tarsal joints, and three hind hooves, mostly joints of low meat value (Figures 24 to 26). These sets of bones inform the depositional history of the pit in several ways. First, articulated bones indicate areas that have not been disturbed. Second, they help us distinguish upper and lower depositional episodes (see below). Third, since they must have been placed in the pit while relatively fresh, they are prime candidates for radiocarbon dating.

The nature of the articulated bone distribution is evident in a profile view looking northwest (Figure 27) where the uppermost articulating bones lie in an arcing distribution marking a depositional distinction from the overlying material, which contains darker matrix, smaller bone fragments, FBR, and most of the "upper" artifacts. In contrast, most of the "lower" artifacts are both below and amongst the lowermost articulating bones. It suggests the "lower" pottery and bone tools, articulating bones and skulls, and the "upper" camp debris and artifacts were distinct depositional events. A small sherd found amongst the "upper" group of artifacts, may be from the pot found at the bottom of the pit implying a rapid sequence of deposition.

Few articulated bone units have been found in HSI pit features in the past so their abundance in Feature 2b-1 implies they were deposited at one time. As supporting evidence, and to explore the possibility that the pit relates to a discrete

Table 6. Summary of anatomically articulated bone units recovered in Feature 2b-1.

Unit	Level	Description	Side	Elements
1	3	carpal joint	right	radius, carpals
2	3 to 4	tarsal joint	left	tibia, all tarsals, metatarsal
3	3 to 4	tarsal joint	left	tibia, all tarsals, metatarsal
4	4 to 5	two vertebrae	axial	cervical
5	5	front hoof	right	metacarpal, sesmoids, phalanges
6	5	elbow joint	left	humerus, radius, ulna
7	5	front hoof	right	metacarpal, sesamoids, phalanges
8	5	radius/ulna	left	prox. radius and ulna
9	5	radius/ulna	right	prox. radius and ulna
10	6	three vertebrae	axial	cervical 4, 5, 6
11	6	hind hoof	right	metatarsal, phalange
12	7 to 8	tarsal joint	right	tibia, tarsals, metatarsal
13	9	tarsal joint	left	tarsals, tibia
14	7 to 8	hind hoof	left	metatarsal, sesamoids, phalanges
15	8	hind hoof	left	metatarsal, sesamoids, phalanges
16	8	carpal joint	left	radius/ulna, carpals, metacarpal
17	9 to 10	carpal joint	right	radius/ulna, carpals

Figure 24. Articulated tarsal unit #3, Feature 2b-1, Level 3.

Figure 25. Articulated tarsal unit #13 and hind hoof unit #14, Feature 2b-1, Level 8.

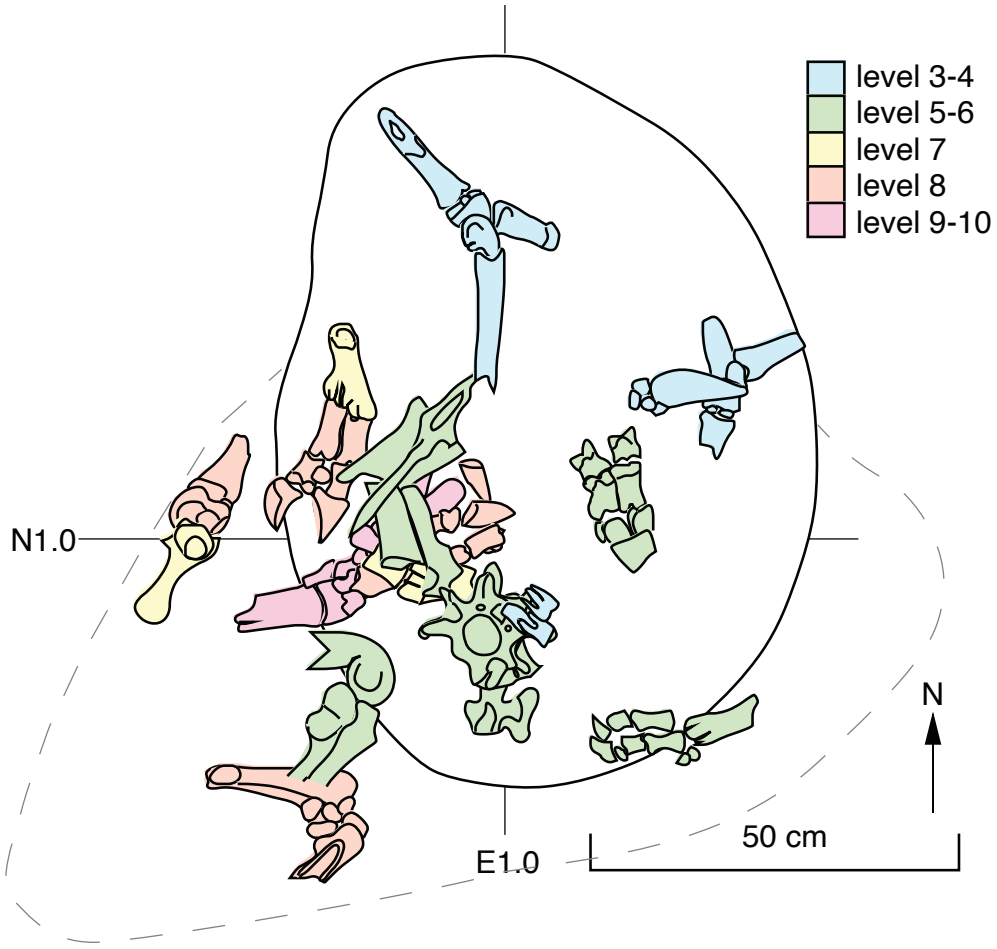

Figure 26. Composite plan drawing of articulating bone units in Feature 2b-1.

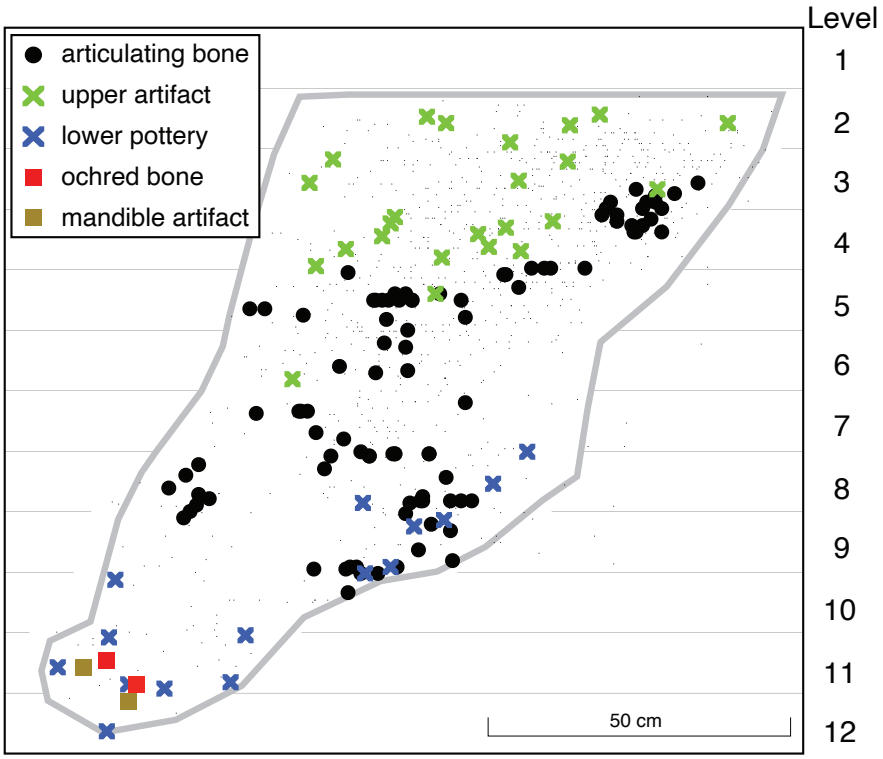

Figure 27. Northeast-southwest scatterplot profile of Feature 2b-1 showing locations of artifacts and articulating bones.

hunting/butchering event, individual elements from carpal and tarsal joints were measured to identify bilateral pairs which may have come from the same animal. This procedure is part of what Todd (1987) calls anatomical refitting, which also includes identifying intermembral mates (e.g., humerus and radius). This approach holds promise for understanding the dispersal of butchering units at well preserved sites, especially kill sites. In the context of this pit, it is simply an exploratory analysis providing suggestive, if speculative, results. Anatomical measurements described by Morlan (1991) for carpals and tarsals, Speth (1983) for the radius and tibia, and Walde (1985) for metapodials, resulted in 17 to 24 measurements for each joint. To compare units, I summed the differences between corresponding elements and divided by the number of measurements yielding an average difference. Comparisons were made between all similar units, including those of the same side (e.g., comparing two lefts) to establish some basis for interpretation. Average differences for carpal and tarsal joints are summarized in Table 7.

Among the carpal joints, the closest match is between bone units 1 (right) and 16 (left) which are from Levels 3 and 8, respectively. The best match among the tarsal joints is found between units 2 (left) and 12 (right), which are from Levels 3 to 4 and 7 to 8, respectively. Without reference data regarding typical bilateral difference, no result would be conclusive, but they are suggestive of anatomical refits between right and left units from different parts of the pit. If this is the case, it suggests a certain continuity between the butchering, processing, and disposal of meat units from a single animal. In other words, both right and left portions of the same animal were brought to this spot from the kill site.

4.2.3 Large elements

On a more impressionistic level, we noted, during both excavation and analysis, 39 elements from large or very large animals based on comparisons with reference materials. Among the measured bones, there is one distal humerus which far exceeds anything from our excavations or those of Brink and Dawe (1989) in 1985/86 (Figure 28). A femur of similarly gargantuan proportions (based on a visual comparison with reference material) may well be from the same animal. Both specimens were found in the enigmatic notch or "step" described previously. As noted earlier, skull 5 is also from a rather large individual, by modern standards.

Table 7. Matrices of average difference in element measurements of articulated carpal and tarsal joints, Feature 2b-1. Unit numbers refer to Table 6.

Carpal Joints

Unit (side)	1 (R)	16 (L)	17 (R)
1 (R)	—	0.93	1.86
16 (L)	0.93	—	2.10
17 (R)	1.86	2.10	—

Tarsal Joints

Unit (side)	2 (L)	3 (L)	12 (R)	13 (L)
2 (L)	—	2.03	1.15	1.49
3 (L)	2.03	—	1.34	2.58
12 (R)	1.15	1.34	—	1.87
13 (L)	1.49	2.58	1.87	—

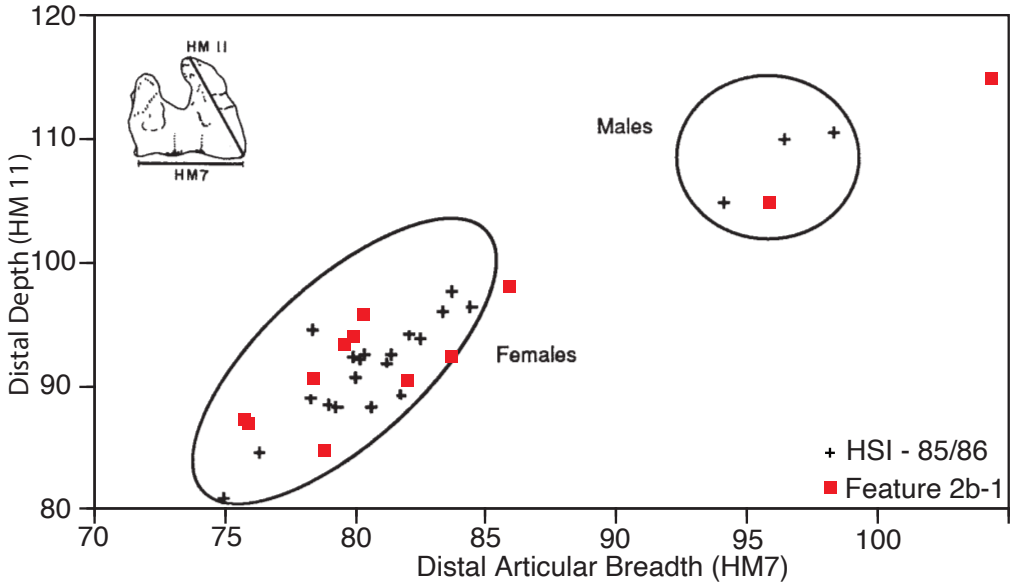

Figure 28. Sexing of distal humeri from Feature 2b-1 compared with similar measurements for 1985/86 excavations. Note the extremely large outlier. Adapted from Brink and Dawe (1989:Figure 56).

4.2.4 Age at death

At the other extreme, there are five foetal bison bones – two phalanges, two ribs, and a parietal bone. Another three bones (maxilla, calcaneus, and hyoid) are from young calves. The remaining bones for which age group could be determined include 149 immature (unfused), 26 young adults (just fused), and 462 adults. The low relative frequency of foetal bone (0.8%), despite good preservation, is typical of HSI, generally, and suggests a similar season of use – probably fall. While the great majority of bison calves are born within a few weeks of the regular calving season (Frison 1974:19) which, in modern populations, occurs over a two-week period between the last part of April and the first part of May (Todd and Hofman 1987:495), a few "out-of-phase" births can occur at any time of the year (Frison and Reher 1970:46).

One of the mandible spatulate artifacts described previously is from a five to six month old animal which, if born during the normal calving season, would have died in October or November.

4.2.5 Other species

The pit contained nine canid sp. bones of dog size including a small skull fragment in Level 5, and fragments of tibia, fibula, metapodials, a tarsal, and a phalanx in Levels 2 and 3 – all of the latter could be from a single right hind limb but they were fragmentary and, although somewhat clustered, not articulated. Given their context, I don't view them as significant to the interpretation of Feature 2b-1. Two Richardson's ground squirrel bones were recovered from the bottom of the pit obviously associated with the relatively recent burrows found there.

5. Radiocarbon dating

Twelve samples were submitted for conventional radiocarbon analysis in 1992 and 1993, all of them bison bone, rather than charcoal, because the only charcoal present occurred as widely dispersed small flecks, a situation which has produced unacceptably late dates in other HSI pits (Brink and Dawe 1989:49) and is not generally recommended as a dating material when bone collagen is available (Evin 1983). Bison bone had several advantages. Its abundance meant there was no shortage of samples for comparative dating of different levels. There were several articulated sets of elements which could be safely assumed to have come from animals killed about the same time the pit was used. It could also be assumed there has been limited vertical movement of bone while small flecks of charcoal could percolate downwards over time (Brink and Dawe 1989:49). The bone was mostly in very good physical condition and seemed likely to contain sufficient collagen for dates. Terrestrial bone collagen is recognized as one of the most reliable dating materials (Evin 1983).

We initially submitted two samples (AECV# 1705C and 1706C) followed by another set of 10 samples. All the dates in Table 8 are corrected but not calibrated. The two marked (*) dates were the first samples submitted for assessment. Although they are internally consistent, when compared with the subsequent ten dates (processed as a second group), they seem out of place. The first two dates average 1515 ± 75 BP while the second set has a mean of 1250 ± 78 BP, about 265 years younger. Such variation in a large group of dates is not too surprising but that it coincides with sample submission period is cause for suspicion that some processing-related error has occurred. Consequently, the first two dates are not included in calculations of the probable age of the pit. The second suite of dates is preferred for the greater number of samples and because they seem more in keeping with the expected date for what appears to be an Avonlea feature. The projectile points and a substantial portion of a ceramic pot all indicate an Avonlea association.

Figure 29 illustrates calibration curves for the ten "acceptable" dates stacked by descending depth (Reimer et al. 2020). The dates vary randomly which is what we would expect when dating a single event. Normally one might suggest that the youngest dates relate to the "event" while the older dates are due to the incorporation of older bone when the pit was filled. But there were several sets of articulated bones in

Table 8. Corrected but uncalibrated radiocarbon dates for Feature 2b-1, arranged by increasing depth. * Indicates rejected dates.

Lab #	Years BP	δ13C	Weight (g)	Sample	Level
AECV# 1765C	1290 ± 80	-19.5‰	241	longbone fragments	2
AECV# 1766C	1200 ± 80	-19.4‰	211	longbone fragments	3
AECV# 1774C	1320 ± 80	-19.5‰	225	articulated tarsals	3
AECV# 1767C	1190 ± 70	-19.2‰	434	longbone fragments	4
AECV# 1706C*	1450 ± 80	-19.2‰	206	longbone fragments	5
AECV# 1768C	1120 ± 80	-19.3‰	439	scapula	5
AECV# 1769C	1260 ± 80	-19.8‰	215	longbone fragments	6
AECV# 1705C*	1540 ± 70	-19.5‰	210	longbone fragments	7
AECV# 1770C	1360 ± 80	-19.6‰	204	astragalus and rib	8
AECV# 1771C	1260 ± 80	-19.7‰	213	two astragali	9
AECV# 1773C	1210 ± 70	-19.6‰	210	vertebra	9
AECV# 1772C	1290 ± 80	-19.5‰	215	articulated radius	10

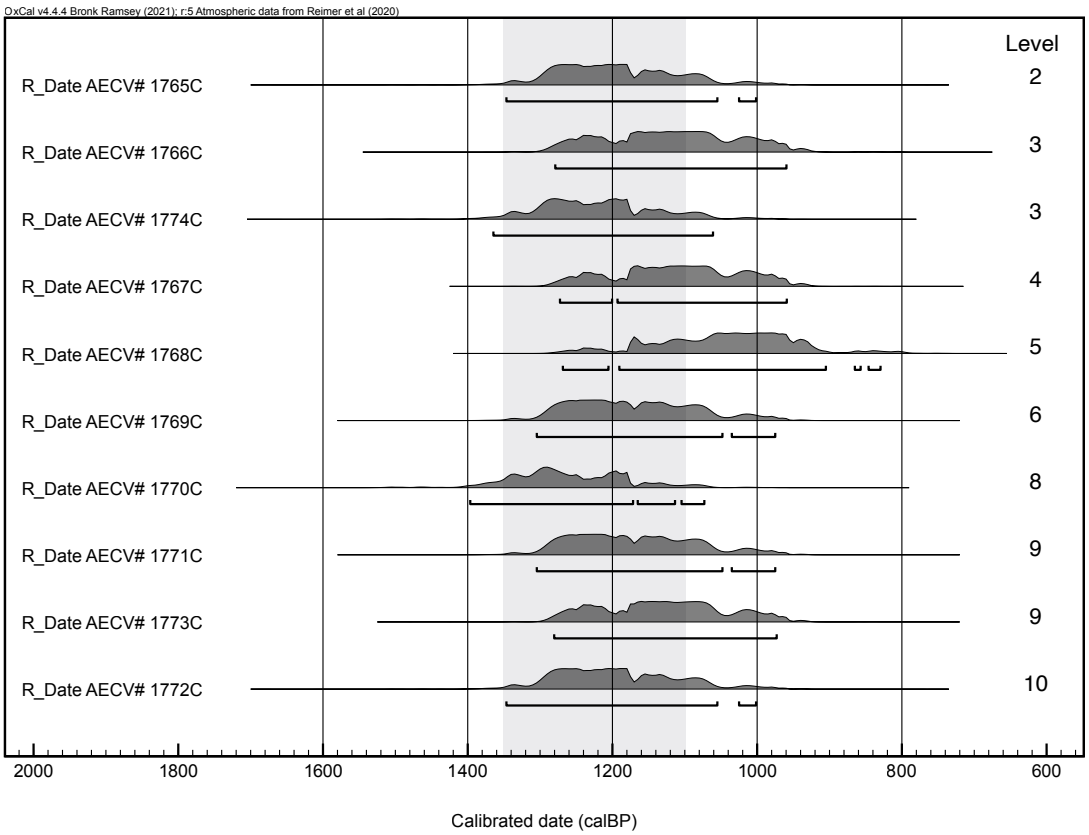

Figure 29. Calibration curves for ten accepted radiocarbon dates from Feature 2b-1. Light grey band shows Avonlea dates suggested by Peck (2011:335). OxCal 4.4.4 used for calibration.

the pit which must have been deposited not long after death – two of these were dated, both yielding some of the oldest dates in the group (AECV# 1774 and 1772). Averaging all the uncalibrated "acceptable" dates results in an estimate of 1250 ±78 BP. Calibrating this averaged date using OxCal v4.4.4 yields a date falling between approximately 1300 and 1050 calBP with about 88% probability. This fits comfortably within the anticipated dates for an Avonlea component (Peck 2011:335).

6. Conclusions

It is common for the contents of a pit to seem out of place relative to its inferred function, usually explained as unrelated refuse deposited after the pit had served its original purpose, often evident by the pit's shape and latent traces like fired soil (e.g., Brink and Dawe 1989:49-57). In Feature 2b-1, however, we have a pit that does not conform in size, shape, or contents with any of the usual functional interpretations. Boiling or roasting pits tend to be shallower and more regular in form. Moreover, there is no evidence of *in situ* heating. We might expect a roasting pit to contain articulated bone units, but not primarily the relatively low value distal limb joints seen in this case. The artifact inclusions at the bottom of the pit also have no evident functional explanation. It is possible the contents are refuse collected while cleaning up a small camp area after a processing event but the ochre-painted bones and mandible digging tools do not fit well with such an explanation. Moreover, it seems implausible a large pit was excavated simply to accommodate refuse; especially in the context of a huge camp/processing area, which must have been strewn with refuse. Contents in the lower portion of the pit, below Level 5, include little of the FBR, debitage, and highly fragmented bone we would expect from a camp cleanup.

I suggest this feature was excavated and most contents deposited as part of a coherent and deliberate sequence of events, but not of the usual sort. With its slanting conical shape, it seems likely the pit started life as an animal burrow that was opportunistically enlarged through digging to suit some purpose. The smoking gun lies at the bottom of the pit in the form of two bison mandible digging implements. Once satisfied with the pit's form and dimensions, these were among the first items deposited in the pit along with two red ochre-painted bones and several large fragments of a single pottery vessel, which had been previously broken and exposed to fire while partially covered with organic

material that became carbonized. Several large faunal elements, including two skull portions, were then placed in the narrow bottom of the pit amongst and above these artifacts (Levels 10 and 11). Additional bones were added in Levels 8 and 9, including several skulls and articulated distal limb joints, the latter positioned around the edges of the pit while a large skull was placed in the centre. Adjacent crania may have been purposefully positioned to be similarly oriented. A few bones from very large bison were included in this depositional episode. The skulls were covered with additional bison elements, including more articular joints some possibly from the same animals deposited earlier. The spacing of some of the bones raises the possibility that other organic materials, such as viscera and hide, were included – indeed, this seems likely. At this point, the pit had largely been filled but a substantial depression remained. The sloping contour of the depression suggests items were thrown into the pit from its northeast edge (Figure 27). The depression was then filled with a mix of fragmented bone of variable preservation, a variety of stone artifacts and small pottery fragments, FBR, and a dark silt matrix – a mixture quite commonly found in pit features at HSI. Admittedly, these upper pit contents could relate to a later intrusive pit, but I think that is unlikely. Alternatively, the sloping interface between the "lower" and "upper" deposits may be partially the result of slumping or settling of the "lower" deposits. But it is notable that all diagnostic artifacts from the "upper" deposits are consistent with the Avonlea affiliation ascribed to the "lower" deposits. Thus, regardless of particulars, the two depositional events probably were not very disparate in time. Moreover, it is the "lower" component that is of particular interest and there is little doubt it represents a single or rapid sequence of deposition. The lower group of artifacts – pot, digging tools, ochre-covered bones – could be viewed as being buried beneath a considerable mass of fresh bones and probably other bison remains, possibly related to a significant occasion. The capping layer of more typical camp refuse can be seen as "closing" the preceding event.

Large features with some similarities to Feature 2b-1 have been previously investigated at HSI. A notable example is a large pit partially exposed in 1987 that "contained 30 nearly complete vertebrae and several fragmentary bison crania, including seven horn cores, representing at least four individuals, and one largely complete skull near the very bottom" (Brink and Dawe 1988:14-15). It has a regular basin shape and is interpreted as a boiling pit with unrelated contents.

A moderately large pit feature salvaged during 1992 monitoring of road work at DkPj-1 contained a substantial amount of bison bone including most of a large skull and an ochre-painted bone disc (Damkjar 1995:83). The pit may have been a repurposed food processing pit, but the skull and painted bone disc imply something more significant.

A large pit feature excavated on the south knoll of DkPj-35, a Besant camp/processing site immediately adjacent to HSI, contained four articulated bison lumbar vertebrae with an associated innominate, a concentration of whole metapodials, and a complete left forelimb. The pit reached a depth of 70 centimetres below surface and was covered with sandstone slabs. A bison rib found near the bottom of the pit has a rounded, worn end which could indicate its use as a digging tool (Fedirchuk 1991:59-75). This pit and its contents are thought to be associated with the processing of bison remains.

A second smaller pit at DkPj-35 was similarly capped with sandstone slabs and contained a bison cranium lying on its side along with long bone fragments (Fedirchuk 1991:85-93). While unspecified bison processing is inferred, Fedirchuk (1991:102) also suggests a possible relationship to ritual or ceremony.

Parallels can also be seen with other large pit features from southern Alberta. Byrne (1973:20-21) describes a pit from the Morkin site (DlPk-2), which is larger, both in depth and diameter than Feature 2b-1, with an apparently "built up" floor of cobbles, miscellaneous fill, and several bison skulls. Although intruded upon by a later pit excavation, the original pit has two associated radiocarbon dates of 700 ± 90 ^{14}C yr BP (GX-2260) and 670 ± 95 ^{14}C yr BP (GX-1191) (Byrne 1973:Figure 7). Byrne interprets this as a ceremonial pit.

Wilson (1983) investigated an isolated pit feature at the Donald site (EePl-218) in Okotoks, Alberta. The pit had been truncated by a bulldozer but enough remained to estimate its length and depth at 125 centimetres and 40 centimetres, respectively. The feature contained two large bison skulls, an articulating set of lumbar vertebrae and pelvis, four long bone fragments thought to be digging tools, a chopper, and a hammerstone. Interpreted as a ceremonial feature, it dates to 3660 ± 150 ^{14}C yr BP (RL-901) (Wilson 1983:9).

A feature with some remarkable similarities to Feature 2b-1 was excavated at FdOt-1, near Hardisty, Alberta (Wondrasek et al. 2017:88-109). FdOt-1, Feature 10, is much larger horizontally (ca. 400 centimetres by 175 centimetres) than it is vertically (165 centimetres) and it is evident it started life as an animal burrow that was somewhat enlarged and

then filled with bison bone, including portions of nine skulls and nine sets of articulated bones (six vertebral sections and three distal limb sets). In addition, canid bones including a skull and substantial articulated vertebral section were present. A variety of stone artifacts include two Old Women's and two Avonlea projectile points, all from upper levels of the feature. Like Feature 2b-1, there is a substantial portion of a single ceramic vessel, in this case identified as Ethridge Ware; cord-roughened with an out-turned rim and diagonal impressions along the front edge of the lip (Wondrasek et al. 2017:106). Walde et al. (2010:151-152) would assign this component to the Upper Kill Phase of the Avonlea Horizon, though Meyer has indicated the pot seems to be a late example of Ethridge Ware, transitional between Avonlea and Old Women's pottery (Wondrasek et al. 2017:106). Consistent with this interpretation, dates for FdOt-1, Feature 10, are between 890 ± 30 ^{14}C yr BP (Beta-387934) and 940 ± 30 ^{14}C yr BP (Beta-387935), ca. 300 years younger than Feature 2b-1 (Wondrasek et al. 2017:Table 31). Wondrasek et al. (2017:109) suggest FdOt-1, Feature 10, had a ceremonial function, possibly relating to a feasting event.

At the nearby site of FdOt-31, Moors et al. (2010:79-85) excavated what they interpret as an ovate feature (Pit Feature B) approximately 65 centimetres by 60 centimetres and 50 centimetres deep in a clear Avonlea context and a date of 956+/-40 ^{14}C yr BP (BGS 2915). Much smaller than most of the previously discussed features, similarities lie in the substantial amount of bison bone, the large average bone fragment size, and the presence of 13 skull portions though, overall, axial elements predominate. Beneath Pit Feature B was a large animal burrow containing more bison bone, including another skull, thought to have dropped down into the burrow from above. Notwithstanding this very likely explanation, the co-occurrence of bison skulls, other bison bones and an animal burrow is intriguing, especially from the floor plan (Moors et al. 2010:Figure 5), and considering its proximity in age and location to FdOt-1. This feature has been interpreted as ceremonial in function.

The above examples illustrate the challenges of ascribing functional interpretations to some pits, especially those with unusual shapes and contents such as bison skulls, when looking for a functional explanation related to food processing or simple refuse accumulation. The prominent placement in Feature 2b-1 of the skull of a particularly large individual, along with limb bones from this or a similarly large bison, points to something out of the ordinary. Ritual and ceremony are often invoked by archaeologists in the absence of more straightforward explanations for such occurrences. The bison skull is a common element in Plains Indigenous ideology (Frison 1971:228; Miller 1973; Wilson 1981; Verbicky-Todd 1984:228). The use of bison skulls in an apparently symbolic context is known from a Late Precontact context at the Crepeele site in Manitoba (Nicholson and Nicholson 2007; Nicholson and Lints 2010), the Vore site, a Late Precontact bison jump in Wyoming (Reher and Frison 1980:19), the Ruby site, a buffalo pound, also in Wyoming, dating to 1670 BP (Frison 1971), and the Cooper site, a Folsom kill site in Oklahoma (Bement 1997:92-93).

It is difficult to envision Feature 2b-1 having served any simple functional role in the processing of bison. The shape is unlike roasting or boiling pits. The contents may be refuse but not of the sort typically found. Artifacts at the bottom of the pit – mandible digging tools, ochre-covered bones, a large pot – are unusual and seem to be deliberate, rather than incidental, inclusions. The bison bone is less processed than is usually the case, better preserved, and seems to have been deposited not long after processing, possibly with viscera and other soft tissue. One or more very large bison were part of the mix. Finally, the concentration of bison crania is unusual;

> "Bones were the subject of much ceremony, as they clearly came to represent the animals themselves. Many groups believed that bones could return to become bison again. … None of the bones were more sacred or used in more ceremonies than the skull" (Brink 2008:113).

I suggest Feature 2b-1 relates to a specific hunting and/or feasting event that required a ritual disposal of associated bison remains and artifacts. Ceremony, ritual and spiritual matters were important elements of Plains Indigenous life in the Historic Period (Oetelaar 2014) and this must also be true of the precontact past, especially during large, important and unpredictable endeavours such as communal bison hunting (Frison 1970:41-42; Verbicky-Todd 1984:228; Brink 2008:106-114). Effective use of the jump at HSI required the skilled and cooperative efforts of many people and success was not guaranteed. There would certainly be celebrations of joy and thanks at the conclusion of a successful hunt, as well as other symbolic activities to promote group solidarity (Brink 2008:112), but such events rarely leave recognizable traces in the archaeological record. Perhaps, this pit marks such an occasion, one that would not have come to light without Jack Brink.

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8. Literature cited

Bement, L.C. 1997. The Cooper site: A stratified Folsom bison kill in Oklahoma. *Plains Anthropologist* 42:85-99.

Brink, J. 2008. *Imagining Head-Smashed-In: Aboriginal Buffalo Hunting on the Northern Plains*. AU Press, Edmonton, Alberta.

Brink, J., and B. Dawe. 1988. The 1987 field season at Head-Smashed-In Buffalo Jump: An interim report. In: *Archaeology in Alberta, 1987*, edited by M. Magne, pp. 9-17. Occasional Paper 32. Archaeological Survey of Alberta, Edmonton, Alberta.

Brink, J., and B. Dawe. 1989. *Final Report of the 1985 and 1986 Field Seasons at Head-Smashed-In Buffalo Jump, Alberta*. Manuscript Series 16. Archaeological Survey of Alberta, Edmonton, Alberta.

Brink, J., M. Wright, B. Dawe, and D. Glaum. 1985. *Final Report of the 1983 Season at Head-Smashed-In Buffalo Jump, Alberta*. Manuscript Series 1. Archaeological Survey of Alberta, Edmonton, Alberta.

Brink, J., M. Wright, B. Dawe, and D. Glaum. 1986. *Final Report of the 1984 Season at Head-Smashed-In Buffalo Jump, Alberta*. Manuscript Series 9. Archaeological Survey of Alberta, Edmonton, Alberta.

Byrne, W.J. 1973. *The Archaeology and Prehistory of Southern Alberta as Reflected by Ceramics*. Mercury Series 14. Archaeological Survey of Canada, National Museum of Man, Ottawa.

Congram, B. 1978. A typological analysis of features from the Saamis site (EaOp-6) and the Stampede Camp site (EaOp-4). In: *The Saamis Site: A Late Prehistoric - Protohistoric Campsite in Medicine Hat, Alberta*, edited by L.M. Brumley, pp. 199-278. Mercury series 79. Archaeological Survey of Canada, National Museum of Man, Ottawa.

Damkjar, E.R. 1995. Final report of the 1991 and 1992 mitigative excavations at Head-Smashed-In Buffalo Jump (DkPj-1) and Dersch Site (DkPj-35), ASA Permit 92-022. Report on file, Archaeological Survey of Alberta, Edmonton, Alberta.

Dawe, B. 1997. Tiny arrowheads: Toys in the toolkit. *Plains Anthropologist* 42:303-318.

Dawe, B., and J. Brink. 1991. Preliminary report of the 1988 and 1989 field seasons at Head-Smashed-In. In: *Archaeology In Alberta 1988 and 1989*, edited by M. Magne, pp. 145-155. Occasional Paper 33. Archaeological Survey of Alberta,Edmonton, Alberta.

Evin, J. 1983. Materials of terrestrial origin used for radiocarbon dating. In: *^{14}C and Archaeology*, edited by W.G. Mook and H.T. Waterbolk, pp. 235-276. PACT 83, Strasbourg, France.

Fedirchuk, G. 1991. The Dersch Locality, DkPj-35, Besant Adjunct to Head-Smashed-In, ASA Permit 89-086. Report on file, Archaeological Survey of Alberta, Edmonton, Alberta.

Frison, G.C. 1970. The Glenrock Buffalo Jump, 48CO304: Late Prehistoric Period buffalo procurement and butchering. *Plains Anthropologist* 15(50) Part 2: Memoir 7:1-45.

Frison, G.C. 1971. The buffalo pound in north-western plains prehistory: Site 48CA302, Wyoming. *American Antiquity* 36:77-91.

Frison, G.C. 1974. *The Casper Site: A Hell Gap Bison Kill on the High Plains*. Studies in Archaeology. Academic Press, New York.

Frison, G.C. 1978. *Prehistoric Hunters of the High Plains*. Academic Press, New York.

Frison, G.C. 1982. Bison dentition studies. In: *The Agate Basin Site: A Record of the Palaeoindian Occupation of the Northwestern High Plains*, edited by G.C. Frison and D. Stanford, pp. 240-260. Academic Press, New York.

Frison, G.C., and C.A. Reher. 1970. Appendix I: Age determination of buffalo by teeth eruption and wear. *Plains Anthropologist* 15(50) Part 2: Memoir 7:46-50.

Frison, G.C., M. Wilson, and D.J. Wilson. 1976. Fossil bison and artifacts from an early Altithermal Period arroyo trap in Wyoming. *American Antiquity* 41(1):28-57.

Kooyman, B. 1990. Final Report of the 1989 Excavation in the North Kill At Head-Smashed-In Buffalo Jump (DkPj-1). ASA Permit 89-053. Report on file, Archaeological Survey of Alberta, Edmonton, Alberta.

Meyer, D., and D. Walde. 2009. Rethinking Avonlea: Pottery wares and cultural phases. *Plains Anthropologist* 54:49-73.

Miller, A.J. 1973. *Braves and Buffalo: Plains Indian Life in 1837*. Public Archives of Canada Series 3. University of Toronto Press, Toronto.

Moors, M., B. Brenner, and A. Landals. 2010. Historical resources impact mitigation, Transcanada Keystone GP Ltd. Hardisty West Interconnection Facilities, 2009 reroute options, Hardisty Bison Pound: Site FdOt-31 final report, ASA Permit 09-021. Report on file, Archaeological Survey of Alberta, Edmonton, Alberta.

Morlan, R.E. 1991. Bison carpal and tarsal measurements: Bulls versus cows and calves. *Plains Anthropologist* 36(136):215-227.

Nicholson, B.A., and A. Lints. 2010. Revisions to context and dating of ceremonial bison skull. *Plains Anthropologist* 55:251-252.

Nicholson, B.A., and S. Nicholson. 2007. Late Prehistoric ceremonial treatment of a bison skull in southwestern Manitoba. *Plains Anthropologist* 52:317-327.

Oetelaar, G.A. 2014. Better homes and pastures: Human agency and the construction of place in communal bison hunting on the Northern Plains. *Plains Anthropologist* 59:9-37.

Peck, T.R. 2011. *Light from Ancient Campfires: Archaeological Evidence for Native Lifeways on the Northern Plains*. AU Press, Edmonton, Alberta.

Reeves, B.O.K. 1978. Head-Smashed-In: 5500 Years of bison jumping in the Alberta Plains. *Plains Anthropologist* 14:151-174.

Reeves, B.O.K. 1983a. Six millenniums of buffalo kills. *Scientific American* 249:120-135.

Reeves, B.O.K. 1983b. *Culture Change in the Northern Plains, 1000 B.C.-A.D. 1000*. Occasional Paper 20. Archaeological Survey of Alberta, Edmonton, Alberta.

Reher, C.A., and G.C. Frison. 1980. The Vore site: 48CK302, A stratified buffalo jump in the Wyoming Black Hills. *Plains Anthropologist* 25(88) Part 2: Memoir 16.

Reimer, P.J., W.E.N. Austin, E. Bard, A. Bayliss, P.G. Blackwell, C. Bronk Ramsey, M. Butzin, H. Cheng, R.L. Edwards, M. Friedrich, P.M. Grootes, T.P. Guilderson, I. Hajdas, T.J. Heaton, A.G. Hogg, K.A. Hughen, B. Kromer, S.W. Manning, R. Muscheler, J.G. Palmer, C. Pearson, J. van der Plicht, R.W. Reimer, D.A. Richards, E.M. Scott, J.R. Southon, C.S.M. Turney, L. Wacker, F. Adolphi, U. Büntgen, M. Capano, S.M. Fahrni, A. Fogtmann-Schulz, R. Friedrich, P. Köhler, S. Kudsk, F. Miyake, J. Olsen, F. Reinig, M. Sakamoto, A. Sookdeo, and S. Talamo. 2020. The IntCal20 Northern Hemisphere radiocarbon age calibration curve (0–55 cal kBP). *Radiocarbon* 62:725-757.

Rollans, M. 1987. *Interpreting the Function of Bison Drive Lanes at Head-Smashed-In Buffalo Jump, Alberta*. M.A. thesis, Department of Anthropology, University of Alberta, Edmonton, Alberta.

Speth, J.D. 1983. *Bison Kills and Bone Counts: Decision-Making by Ancient Hunters*. University of Chicago Press, Chicago.

Todd, L.C. 1987. Taphonomy of the Horner II bone bed. In: *The Horner Site: The Type Site of the Cody Complex*, edited by G.C. Frison and L.C. Todd, pp. 107-198. Academic Press, Orlando, Florida.

Todd, L.C., and J.L. Hofman. 1987. Bison mandibles from the Horner and Finley sites. In: *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by G.C. Frison, and L.C. Todd, pp. 493-539. Academic Press, Orlando, Florida.

Verbicky-Todd, E. 1984. *Communal Buffalo Hunting Among the Plains Indians*. Occasional Paper 24. Archaeological Survey of Alberta, Edmonton, Alberta.

Vickers, J.R. 1983. Final report, historical resources impact assessment, Temporary Interpretation Facility at Head-Smashed-In Campsite DkPj-2, ASA Permit 82-021. Report on file, Archaeological Survey of Alberta, Edmonton, Alberta.

Walde, D. 1985. *On Assigning Gender to Post-Cranial Bison Bones*. M.A. thesis, Department of Anthropology, University of Victoria, Victoria, British Columbia.

Walde, D., D. Meyer, and P. Young. 2010. Precontact pottery in Alberta: An overview. *Manitoba Archaeological Journal* 16:141-165.

Wilson, M.C. 1981. Sun Dances, Thirst Dances and Medicine Wheels: A search for alternative hypotheses. In: *Megaliths to Medicine Wheels: Boulder Structures in Archaeology,* edited by C.R. Wilson, K.L. Road, and K.J. Hardy, pp. 333-370. Proceedings of the Eleventh Annual Conference, Chacmool. The Archaeological Association of the University of Calgary, Calgary, Alberta.

Wilson, M.C. 1983. The pit and the conundrum: The Donald site (EePl-218), a Middle Period bone-filled pit feature in Okotoks, Alberta. *Alberta Archaeological Review* 7:3-16.

Wondrasek, R., R. Lindemann, A. Burchill, and E. Perry. 2017. Historical resources impact mitigation: Endbridge Edmonton to Hardisty Pipeline final report, ASA Permit 15-064. Report on file, Archaeological Survey of Alberta, Edmonton, Alberta.

Wright, M., and J. Brink. 1986. Preliminary report of the results of the 1985 field season at Head-Smashed-In. In: *Archaeology in Alberta, 1985*, edited by J.W. Ives, pp. 130-139. Occasional Paper 29. Archaeological Survey of Alberta, Edmonton, Alberta.

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