

REPORTS

THE BUFFALO POUND IN NORTH-WESTERN PLAINS PREHISTORY: SITE 48 CA 302, WYOMING

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ABSTRACT

The Ruby site, 48 CA 302, in the Powder River Basin of Wyoming, is a buffalo pound dating to late Middle Period with a radiocarbon age of 1670 ± 135 years: A.D. 280 (GX-1157). The site was contained in steadily aggrading alluvial deposits allowing close stratigraphic control. Features included most of a buffalo pound, part of the drive lane, and an associated ceremonial structure.

An attempt to explain the operation of this pound is based on historical accounts for various northwestern Plains tribes and on problems of buffalo handling encountered with modern herds, allowing for changes brought about by the introduction of the horse. The ceremonial structure is explained in the context of shamanistic activity occurring with communal hunts in ethnographic and historical accounts. Archaeological data from the same area and time period suggest this pound is a variant of other communal buffalo procurement methods, including buffalo jumps, that occurred yearly to provide food for winter use and that required consolidation of the society into larger groups than could effectively exploit the environment during the remainder of the year.

A large segment of the meat processing area remains intact and will eventually be used in an attempt to test hypotheses concerning butchering methods, tool use, and nature of social groups involved.

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Site 48 CA 302 is a single component site with three separate but closely interrelated parts. One of these is a bison pound, one is a ceremonial structure, and the other is a processing area for animals killed in the pound. The pound was located in the meander bend of an arroyo which at that time was steadily aggrading from alluvium and slope wash. Deposition continued to as much as ten feet over parts of the site and formed a terrace. At this point there was an abrupt change to an arroyo-cutting cycle that cut a profile through part of the site.

This bison procurement complex is a late Middle Prehistoric period manifestation—radiocarbon age is 1670 ± 135 years: A.D. 280

(GX-1157)—in the extreme southeastern part of the Powder River Basin of Wyoming ($43^{\circ} 40' 30''$ N. Lat.; $105^{\circ} 54' 18''$ W. Long.) (Fig. 1). First knowledge of the site was from the property owners reporting bison bone and artifacts eroding from a steep embankment. Gullying was rapidly destroying the entire site (Fig. 2 a). Excavations were done during the 1968 and 1969 field seasons. The aggraded deposits over the site were apparently sterile. Heavy earthmoving equipment was used to remove the overburden to within about two feet of the cultural level. Upon completion, most of the pound and all of the ceremonial structure was exposed (Fig. 2 b).

The site is located about two miles west of a series of well known landmarks known as the Pumpkin Buttes. These are flat-topped erosional remnants on the divide between the Powder, Cheyenne, and Belle Fourche Rivers that rise nearly 1000 feet above the surrounding plains. The terrain is moderately dissected and dips steeply westward. Bedrock is a coarse, loosely-cemented, easily-eroded sandstone. Plant cover consists of sagebrush and grass in the open country with lines of cottonwood along arroyo bottoms and occasional patches or clumps of juniper on well-watered and protected slopes.

DESCRIPTION AND OPERATION OF THE POUND

The bison pound itself was apparently almost entirely man made, although the bank of the arroyo may have been of some significance in partially forming one side of the restraining wall and in hiding the structure from view until the animals were well inside the drive lane. The pound consisted of an enclosure with a drive lane leading into it. Post holes reveal the outlines of the complex, but nothing remains of the actual structure. At a distance of about 40 feet from the enclosure, the drive lane takes a sharp bend which obscured the pound itself from view of the animals until the last possible instant. The lines of post holes are eight feet apart at the beginning of the bend and widen to a maximum of $11\frac{1}{2}$ feet (Fig. 1). Undoubtedly, the drive lane extended beyond its present

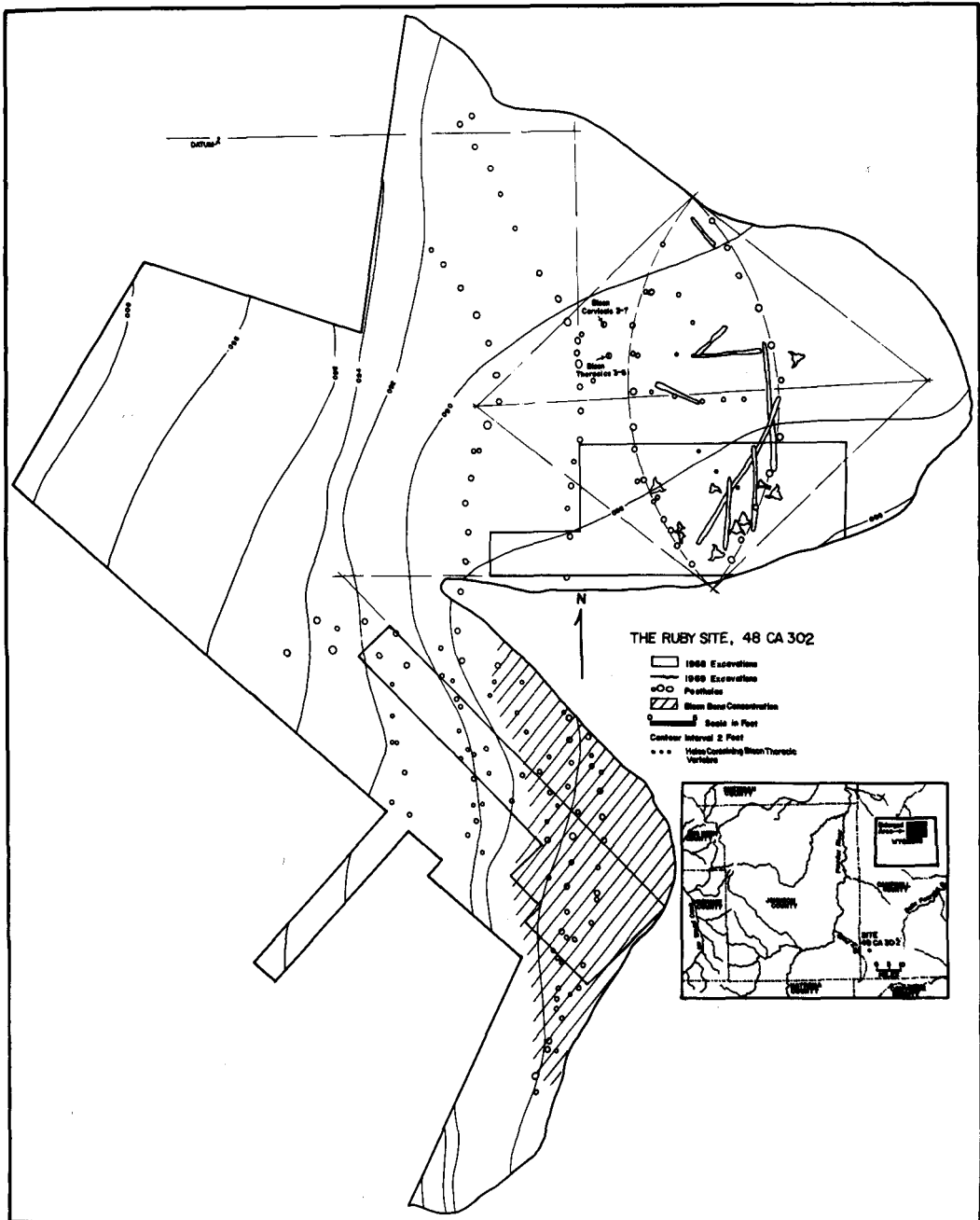


Fig. 1. The Ruby buffalo pound; post holes outline the drive lane (top) entering the pound (bottom) from the north. The ceremonial structure is east of the drive lane.

limits to form long wings diverging away from the trap, but evidence of this has been removed by erosion. The wings were probably of much simpler construction than the narrow drive lane closer to the entrance where posts were usually spaced from two to four feet apart. Fragments

of posts were occasionally recovered in the holes, although these were limited to burned ends of juniper (*Juniperus scopulorum*). None of the ends of posts bore marks of any tool. Cottonwood is present in quantities and was probably also used but does not preserve as well

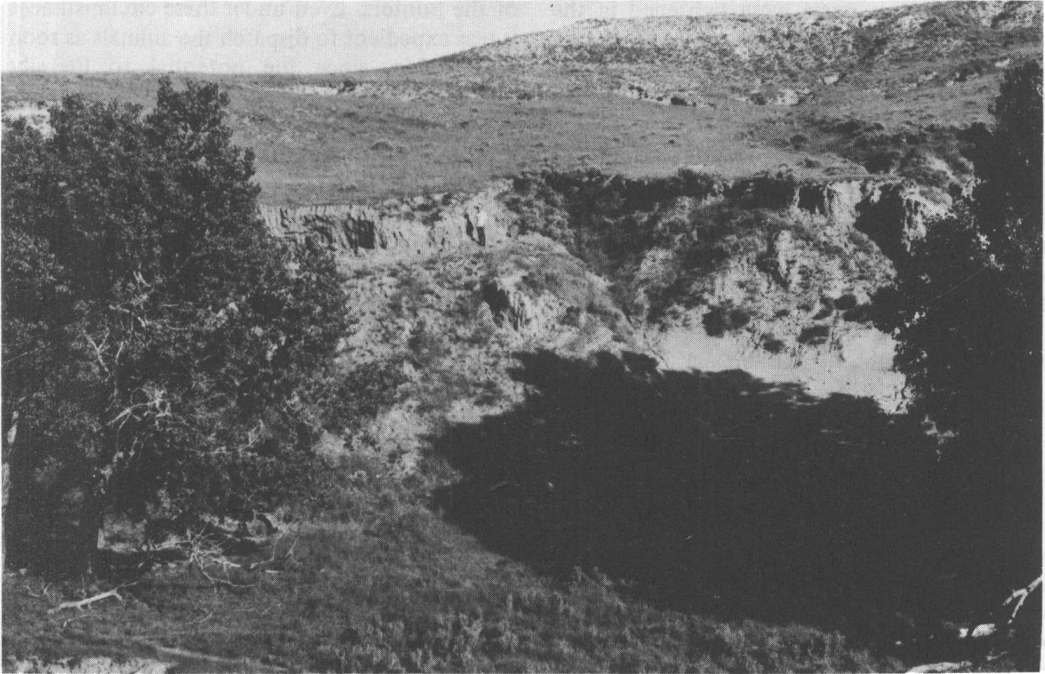
**a****b**

Fig. 2. The Ruby buffalo pound before excavation (*a*); and after, showing a remnant of the bone level in the pound nine feet below the surface (*b*).

as juniper. Many posts were tightened in the hole by forcing bison mandibles, ribs (Fig. 3 *a*), humeri (Fig. 3 *e*), other long bones, and flat stones between the posts and sides of the holes.

The drive lane leads to a restraining structure of which many details are obscure. Part of the structure at least appears to have been two lines of posts (Fig. 1) presumably with logs, and anything else available, piled lengthwise between them to form a vaguely oval-shaped structure. This type of construction is described by DeSmet (Chittenden and Richardson 1905:1028) for the Assiniboine as follows:

To enclose it [the pound] in circular form, stakes are firmly fixed in the ground, and the distance between them filled with logs, dry boughs, masses of stone—in short, with whatever they can find that will answer the purpose.

Umfreville (1790:160) gives much the same account as "trees laid on one another, to the height of about five feet." With continued peeling of the ground in the kill area, several post holes appeared that probably represented different periods of use or modification of the structure. No details of the superstructure remain, but logs placed between the rows of posts would have formed a functional restraining structure. At this time, there are sufficient quantities of large cottonwood (*Populus angustifolia*) logs available to build such a structure.

The post holes extend a short distance up the bank of the arroyo from the entrance. Along the top of the arroyo bank a less sophisticated fence was necessary and would have required fewer posts. Stream erosion apparently removed much of the evidence of the structure at this part of the site.

Several post holes appeared as the floor of the trap was peeled to greater depths. The tops of some of these post holes are as much as six inches deeper than the uppermost ones. They are difficult to interpret, but they may represent either an earlier stage or stages of use or some addition that aided in some way to maim or kill the bison. At least four of these are at an angle and may have contained sharpened posts to impale the animals. Impaling of animals is described for the North Blackfoot, only in this case, the sharpened poles extended inward from the perimeter of the pound (Ewers 1949:359). The activities at 48 CA 302 were undoubtedly directed toward the single purpose of killing buffalo that were confined to a limited area and that were probably quite well under the control

of the hunters. Even under these circumstances it was expedient to dispatch the animals as soon as possible, since the potential to literally reduce a structure of this nature to firewood by even a small herd of buffalo was always present. This can easily be verified by working buffalo in cattle corrals (see also Garretson 1938:50-51).

It is suggested that the animals were being speared or shot with dart points, or both, as soon as they were past the bend in the drive lane, just before reaching the trap. The projectile points used demonstrate a wide range of descriptive attributes that fit into the temporal position indicated by the radiocarbon date of A.D. 280, that is, the latter part of the late Middle Prehistoric period. Typology becomes somewhat difficult when the projectile point assemblage is carefully analyzed. Of 201 classifiable specimens, 23% demonstrate unmistakable evidence of having been modified from their original form. Others, lacking proximal or distal ends, were probably also similarly changed. The general type was a large symmetrical dart point with convex blade edges and a barbless corner notch and with, usually, a slightly convex and, rarely, a straight or slightly concave base (Fig. 4 *a, b*). When broken through use, the distal ends were often reused with the transverse break forming the new base and notches added distally to the break (Fig. 4 *e*). If the break was not at right angles to the longitudinal axis of the point, the notches were skewed as a result, which was compensated for by removing a few flakes on one blade edge near the point. This resulted in a significant number of projectile points asymmetrical in outline form. Projectile points broken distally were often repointed, and this was done in such a manner that a sharp tip was made changing the configuration of the blade edges so that they were noticeably concave near the point (Fig. 4 *c, h, i, k*). Others have blade edges completely reworked (Fig. 4 *p, q*). Notches vary from shallow and wide (Fig. 4 *d, m, r*) with no barb to deeper with a slight barb (Fig. 4 *f, g, p*) and to deep and narrow with a pronounced barb (Fig. 4 *n, o*). One (Fig. 4 *o*) demonstrates a deliberate base notch.

Rather than attempt to assign specific type names, it seems of more importance to mention their functional attributes. Hafting areas, including the base and the notches, are ground smooth to provide the optimum strength in

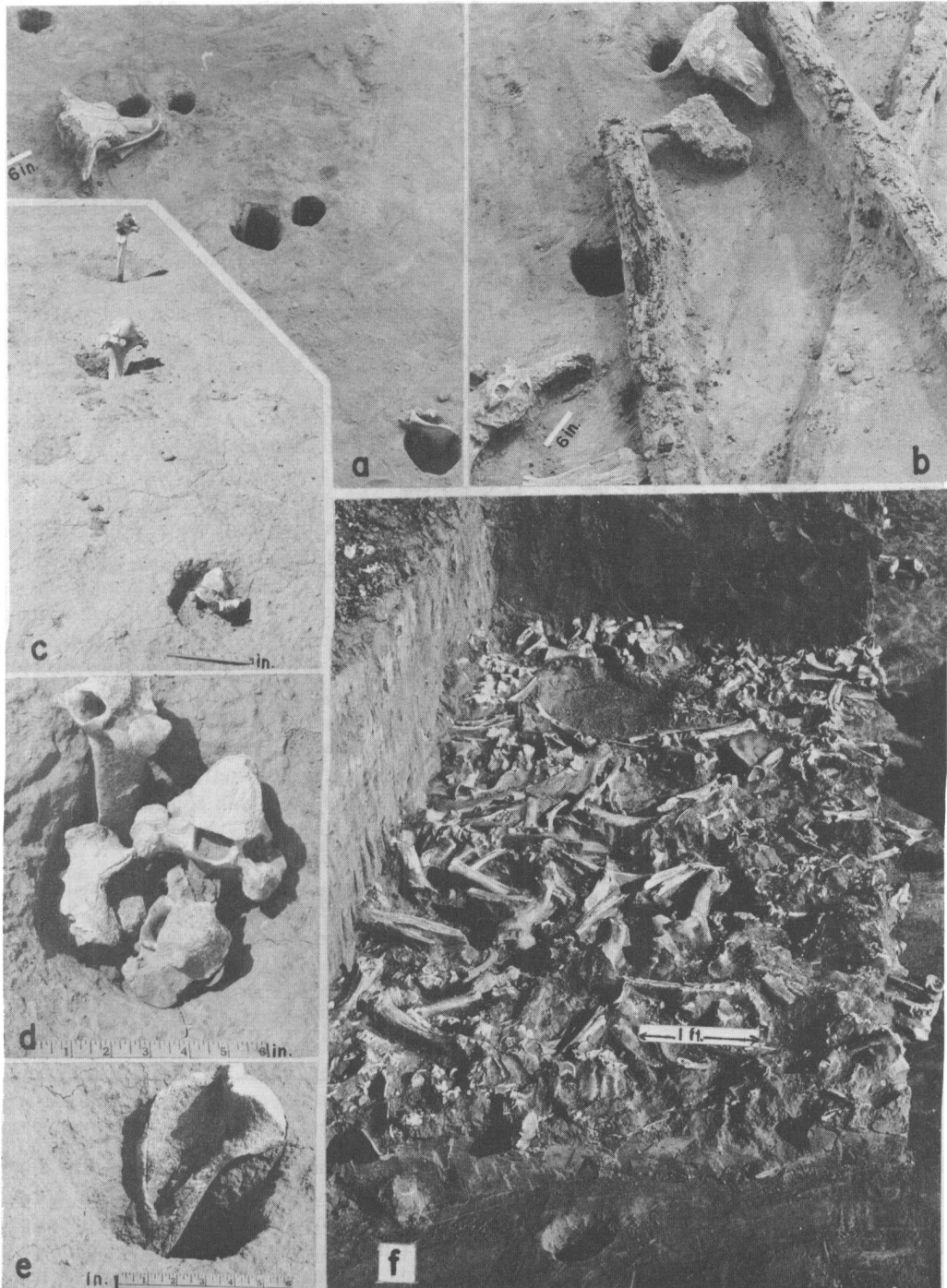


Fig. 3. *Bison bison* skulls, decomposed logs and post holes (a, b, e), holes containing thoracic vertebrae in the ceremonial structure (c) and a hole containing four thoracic vertebrae outside (d); bone concentration and a post hole in the pond (f).

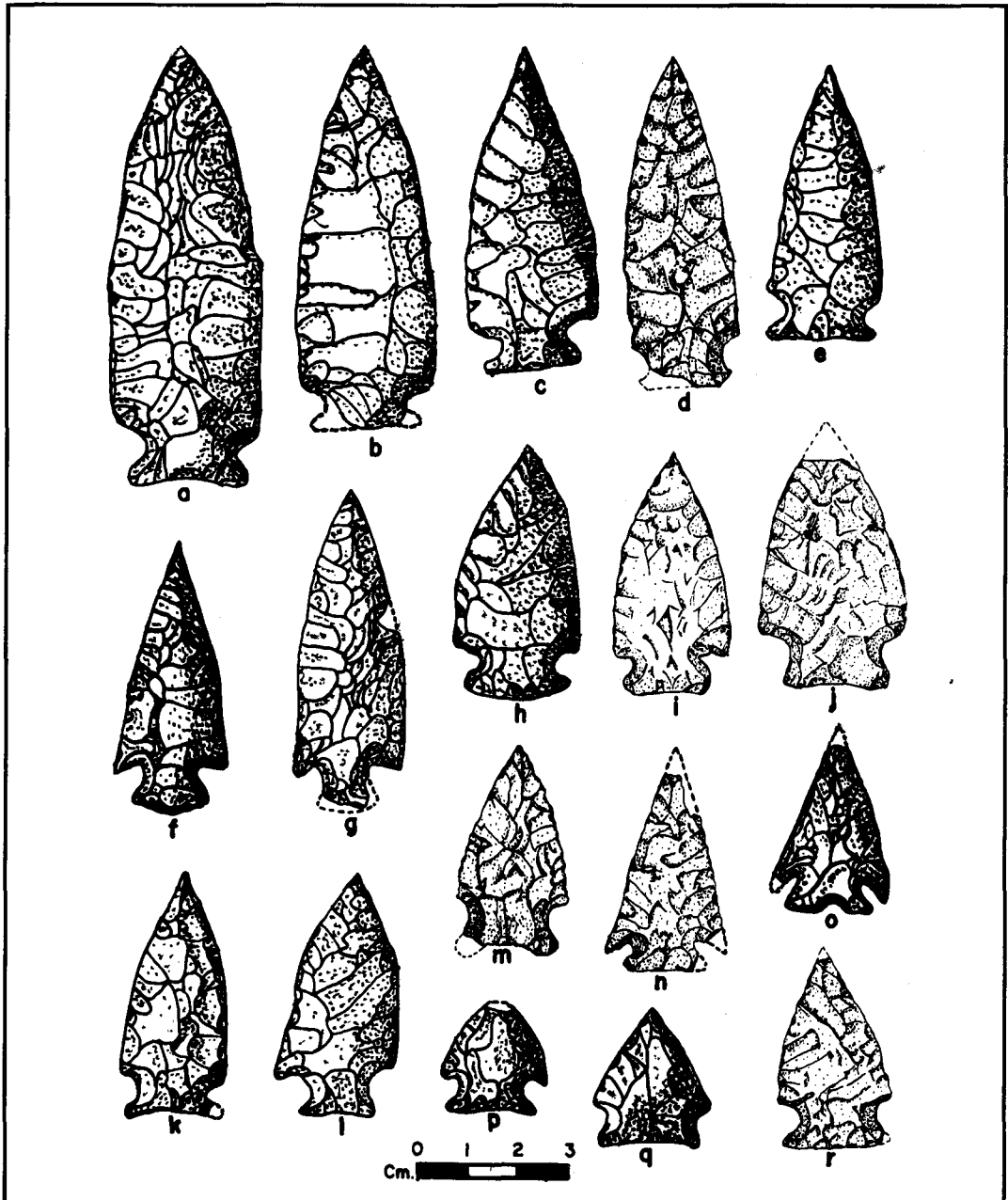


Fig. 4. Projectile points from the Ruby buffalo pound.

bonding the shaft and point. Even so, 59% of the recovered projectile points were broken either across the notches or from one notch diagonally to the base, suggesting rough usage which could indicate the use of thrusting spears with long shafts as well as dart shafts. An almost complete lack of basal parts of projectile points suggests that they were recovering the

wooden hafting elements for reuse. The dimensions of the drive lane and the pound are such that the animals were easily within hand-spear-throwing range. A wide range in size of projectile points is present (Fig. 4). Bones of badger (*Taxidea taxus*), bobcat (*Lynx rufus*), and hawk (*Buteo regalis*) in the kill area suggest possible hunting of carnivorous animals and

birds that would undoubtedly have been attracted to a situation of this nature and may account somewhat for the considerable disparity in projectile point size.

Butchering at the pound consisted of cutting the animals into pieces that could more easily be moved to the processing area. Articulated parts or butchered units remaining in the pound are difficult to explain, unless they represent an overkill of more meat than could be processed at one time. Undoubtedly, some trapping operations were more successful than others, which would have resulted in differential carcass utilization from time to time. It is possible also that the butchered units in the pound may have had the meat removed without continuing the process to the extent of pounding and boiling bones for grease as was done in the processing area. None of the bones remaining in the pound represent complete carcasses. The heavy bone concentration extended beyond the fence on the lower side of the pound, suggesting there was an opening here at the bottom to remove the butchered carcasses.

The bones in the trap suggest something of the actual butchering process. Long bones were usually not broken but were apparently separated at the joints. Most of the broken long bones appeared as single bones or were articulated with other long bones in post holes and apparently used as wedges. Only about 15% of long bones in the pound were broken, and some of these breaks could have been the result of crowding and pile-ups during the kill. According to historic accounts, the carnage among themselves by a group of trapped buffalo was of considerable proportions (e.g., Hind 1860:355-359). Caudal vertebrae were almost entirely lacking which suggests but does not always indicate a stylized process of hide removal. Mandibles were often paired but separated from the skull, which suggests removal of tongues. Skull deterioration was so complete as to leave no proof of brain removal. The humerus along with the radius-ulna was the most commonly recovered butchering unit. Occasionally, the metacarpal and remaining foot bones were also attached. Femur and tibia represent another common unit. Pelves were commonly broken at the narrow parts of the ilium, ischium, and pubis distally from the acetabulum. On smaller animals, the entire pelvis or pelvis-sacrum and 2-4 lumbar vertebrae are a common unit. Ribs were usually broken close to the articular end, presumably after the axial

muscles were removed. Cervical vertebrae often with one or two thoracics form a recurring butchering unit, and five to seven thoracic vertebrae with dorsal spines broken and retaining the proximal rib ends form another common unit. Some of these units and techniques are similar to those found in butchering areas of nearby Late Prehistoric buffalo jumps (Frison 1967a:167-172).

Several proximal ends of femora and humeri were broken and bear deep gouging marks into the cancellous bone, suggesting that the butchers were enjoying this delicacy while dismembering the carcasses. A rib gouging tool (Fig. 6 a) may have been used for this purpose. Fetal bones were almost totally lacking in the butchering area, but several were found in the part of the processing area that was tested suggesting that these were being taken as a food item. Tooth eruption indicates that four to six-month calves, long yearlings, and long two-year olds were present, which suggests a fall operation.

Only one chipped stone tool from the kill area is complete and functional (Fig. 5 f). Eight others are either fragments or remnants that had been used and resharpened until they were no longer usable or had become weakened until the normal stresses and strains of use caused them to break. It is not possible to explain the amount of butchering that occurred by the amount of tools recovered. There were, however, 3008 flakes recovered from the kill area. Less than 2% of these are regarded as the possible results of tool manufacture. The majority were the result of tool sharpening. In a nearby, large, communal bison procurement site, the sharpening flakes were used as a basis for interpretation and for a proposed classification into which flake assemblages of this nature can be separated (Frison 1968a). The Ruby site assemblage offers the same basis for interpretation.

There were two basic functional tool types. One employed a working edge sharpened bilaterally to form a tool lenticular in cross-section. The other was either sharpened unilaterally or bilaterally so the tool cross-section was plano-convex. In the former case, the original flat side of the flake was used as one side of the tool; in the latter, the flat side was maintained by flake removal. The flakes removed in different sharpening techniques are distinctive, and the type of working edge used can be determined from the flake type in most cases.

Both types of working edge appear on the one complete tool recovered from the pound. Blade edges form a working edge lenticular in cross-section, and the base forms a working edge flat on one side and steeply-beveled on the opposite side. Both working edges demonstrate microscopic evidence of use (Fig. 5 *f*). Another tool was used and resharpened bilaterally on one blade edge repeatedly until it was broken and discarded (Fig. 5 *e*). Resharpener flakes from both tools were among flakes recovered in the pound. Two plano-convex end scrapers were found in the pound, and use marks on the working edges suggest use as scraper planes.

The variety of stone flaking materials comprising the sharpening flakes indicates the actual use of more than 75 separate tools in the kill area as compared with only nine broken and complete recovered tools. The sharpening process appears to have been accomplished by use

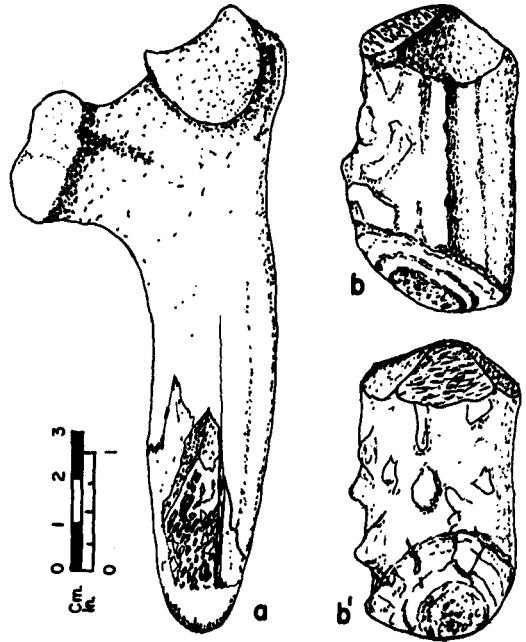


Fig. 6. Bison rib gouging tool (*a*) and two views of an antler hammer (*b*, *b'*) from the Ruby buffalo pound.

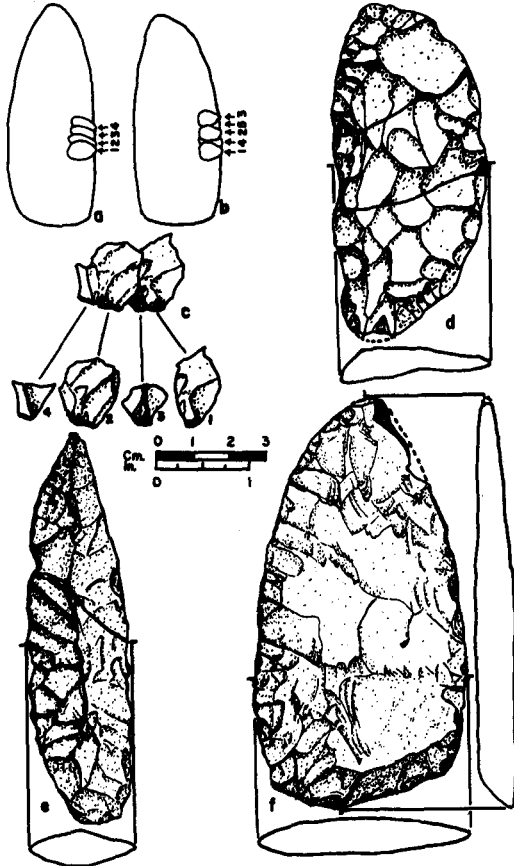


Fig. 5. Schematic of flake removal (*a*, *b*), series of matching flakes (*c*), chipped stone tools from the pound (*e*, *f*) and the processing area (*d*) of the Ruby buffalo pound.

of a soft hammer and one of these was recovered from the kill area. This tool was fashioned from the proximal end of a large deer antler. The part where it attached to the skull lacks a cancellous center and this end was ground to produce two narrow working faces that demonstrate evidence of continued hammering. The opposite end is cut at an angle and was also presumably used as a hammer, although it is too badly decomposed on this end to confirm this usage (Fig. 6 *b*, *b'*). By experiment, this soft hammer produced the types of sharpening flakes found in the kill area.

Two definite techniques of flake removal were determined from series of matching flakes recovered from the kill area. In one method a continuous sequence of closely-overlapping flakes was removed (shown schematically in Fig. 5 *a*); in the other, the object was also to remove a continuous sequence of flakes that may or may not overlap but leaving a greater distance between striking platforms. This latter technique required a second series of flakes to complete the sharpening of the edge (shown schematically in Fig. 5 *b*). This results in a distinctive series of flakes which usually identifies the technique. One series of four flakes was recovered from the pound (Fig. 5 *c*). This technique made it more difficult to reconstruct

worn tool edges from the sharpening flakes. Often a combination of both techniques were used in a single sharpening process.

Most bone in the kill area was rather badly decomposed with most butchering marks removed. A bison mandible demonstrates wear striations on a transverse break at the first premolar and may have been used as a tool for digging post holes. Several other broken bones including a scapula, an ulna, and three dorsal spines bear similar use marks.

Two manos of hard sandstone were obviously used in the kill area as hammerstones, since heavy pounding marks on the end were made subsequent to earlier grinding use. Two angular pieces of hard sandstone also show hammerstone use. The scarcity of hammerstones fits well with the small number of long bones broken in butchering.

THE CEREMONIAL STRUCTURE

Twenty feet east of the pound and six feet from the drive lane is another post hole pattern along with remains of badly decomposed logs. The post holes outline a structure 39 feet long and 15 feet wide (Fig. 1). The sides of the structure are arcs of circles with radii of about 33½ feet. From the precise placement of the post holes, it is suggested that this structure was initially laid out by marking off intersecting arcs from two points 51 feet apart and with 33½ feet radii. Five more post holes span the structure at its widest point. Orientation is almost true north. Inside the south half of the structure are three small holes (2½" - 3" diameter and 7" - 10" deep), each containing either the third or fourth bison thoracic vertebra with the dorsal spines in the holes (Fig. 3c). Around the south end of the structure were six buffalo skulls lacking the mandibles (Fig. 3a, b; Fig. 1). Two other skulls give the impression of having originally been part of the same pattern but were subsequently moved. A complete bison scapula appeared alongside one skull.

Two holes outside the structure on the west side were of an unusual nature. One contained four thoracic vertebra with the dorsal spines in the hole (Fig. 3d), and the other contained the articulated cervical vertebrae excluding the axis and atlas. Obviously, neither hole could have contained a post.

Although badly decomposed, the remaining logs of juniper (*Juniperus scopulorum*) suggest

part of the superstructure. The longest is almost 20 feet long, the distance from the end of the structure to the center. The next longest log is 15 feet or the distance across the center. Two other pieces suggest rafters. From their positions, it appears the structure fell to the east with the ridge pole on top of the center cross log and two rafters on top of the ridge pole. The post holes outlining the structure are perpendicular to the ground surface; it is assumed the structure had straight sides. The lack of logs on the north ends suggest that this end may not have been roofed over. Other logs and posts were indicated by wood stains and badly decomposed fragments. It is suggested that both cottonwood and juniper were used in construction, but juniper is the only wood still preserved. Burning of the ends of the logs is indicated in most but not all cases. Decomposition was too advanced to determine tool marks on the unburned ends.

It appears also that the geological deposits began to aggrade while the structure was still standing. Traces of some of the post holes appeared as much as 15 inches above the actual floor of the structure, indicating that stream deposits had settled around the posts, which later rotted away.

This structure beside the trap is interpreted as a ceremonial structure. There is no evidence of the debris usually found on a living floor. The floor itself is manifest only as a hard-packed layer of sandy clay that in profile can be seen as a thin dark level containing an occasional stone flake or a bone fragment. Only one tool, a worn and apparently discarded end scraper was found inside the structure. There were no fires or workshop areas common to habitation structures. If it were a habitation structure, its size should indicate a multi-family group, and evidence for use would be present. The pattern of buffalo skulls placed around one end and the three holes containing thoracic vertebrae suggests ceremonial activity. The two holes between the structure and the drive lane, containing respectively four thoracic vertebrae and five cervical vertebrae, obviously could not have contained posts and may have some connection with the activities that occurred in the structure. The three small post holes in the north end may also have been the supports for some ritualistic object. Speculations on the structure and on the function and form of the individual features included could continue

with little possibility of realizing their exact nature. However, it and the entire bison procurement complex represented at the site becomes meaningful when compared with similar food procurement situations in the historical and ethnological record.

THE BUTCHERING AND PROCESSING AREA

Evidence for processing the carcasses from the kill area appears in the arroyo profile for distances of as much as 900 feet away from the trap. This is manifest by concentrations of charcoal and bone under the same depositional units as the trap and ceremonial complex. It was not possible at that time to remove the nearly 10 feet of sterile overburden, so tests were made only of obvious exposures. On the basis of present evidence, there were a large number of contiguous but separate small processing operations on both sides of the arroyo on both sides of the trap. Each unit consisted of one or two fire hearths, either surface or with a shallow (1"-2") depression and from 28" to 59" in diameter. Quantities of broken and crushed bone around the fire hearths suggest some process such as boiling in hide containers for extracting bone grease. Fire-fractured chunks of tabular sandstone may have been used in stone boiling. These units investigated were separated from each other by a distance of 30 to 50 feet.

Tool types and frequencies differ in the processing areas as compared to the kill area. Large numbers of plano-convex end scrapers were recovered in a wide range of sizes and working edges. Lateral restrictions on these were common presumably for hafting purposes. Side scrapers were common also, of which one (Fig. 5 *d*), recovered in three pieces, is a typical example. Projectile points are rare and of the same general type as from the kill area. Large numbers of retouch flakes in a wide variety of cutting and scraping edges were recovered. Bone tools include several bison ribs, dorsal spines and long bone fragments with no modification other than a worn scraping or gouging edge or point.

Evidence of tool manufacture in the processing area is suggested by an increased frequency (to 60%) of different classes of waste flakes. Tool sharpening flakes are present; a significant increase in end scraper sharpening flakes compared to the kill area is apparent.

One complete milling slab and several broken pieces of both milling slabs and manos suggests some vegetable food preparation, although it could also represent some form of meat preparation. No vegetable remains were recovered by flotation of soil samples. Some camp activity is suggested by two bird bone beads and a large canine tooth with an encircling groove around one end. Evidence of soft-hammer retouch in tool sharpening is indicated by a badly decomposed but identifiable antler hammer made from five inches of the proximal end of a large deer antler, similar to the one recovered in the kill area (Fig. 6 *b, b'*). Future excavations of large sections of the processing area should reveal much information on tool use and bison processing for this time period.

DISCUSSIONS AND COMPARISONS

In order to place the Ruby pound into its proper perspective in Northwestern Plains Prehistory, it is necessary, among other things, to consider the limitations of pre-horse bison procurement. The ethnological and historical records deal almost completely with buffalo procurement as influenced to different degrees by the horse. There are many differences between handling buffalo in large groups with or without horses. With horses, the balance of control over the animals was in favor of the human group. Lacking horses, the balance swung in the other direction, in favor of the buffalo. Post-horse techniques of procurement reveal a general disregard for the stylized methods used in pre-horse times. The continuation of pounding among the Assiniboine and Cree to the end of the buffalo days was probably due to a lack of horses, and probably, also, Blackfoot bands, poor in horses, retained the buffalo drive to a later date than most Plains Indians (Ewers 1955:303-304). The yearly cycle of the buffalo did require a unique adaptation. According to Oliver (1962:54), the buffalo cycle in post-horse times necessitated a basic pattern of fragmented bands in the winter months and concentrated tribal units in the summer months. This was because the rutting season brought the bison together in immense herds and consequently forced the Plains Indian to concentrate in large groups for buffalo procurement. After the rut, the buffalo dispersed and this required a more fragmented society. The fur trade among the Plains Indians was affected because the exploitation of the beaver

required a different seasonal pattern than that required for exploitation of the buffalo (Secoy 1953:43-44). The yearly behavioral pattern of the buffalo affected the pre-horse people also.

The rutting period was during the months of August and September (Hornaday 1887:415; Roe 1951:96), with a gestation period of nine to nine and a half months. Calving time was from mid-April until the latter part of June. In pre-horse times there would have been little reason to attempt to pound or jump buffalo when young calves or cows in rut were in the herd. A cow can be difficult to handle when temporarily separated from a young or new born calf. The behavior of both the cow and bull in rutting season makes driving them difficult if not impossible lacking horses. The only time buffalo could be driven successfully or with a necessary probability of success was when the rutting season was over. October was apparently the central month of communal bison procurement without horses. It was probably begun sometime in late September and extended into November. In terms of weather on the Northwestern Plains, it was expedient in most years to plan for the necessary meat to be cured by the end of October. According to tooth eruption schedules, calves in the pound were four to six months of age. This fits with a mid-April to mid-June birth date for the calves.

Once a sufficient quantity of meat for storage was obtained, there would be little incentive for continuation of communal driving. The nature of tribal economy is such that it is not organized for sustained production (Sahlins 1968:77). Leadership is required for the period of communal procurement, since the coordination of a number of persons is required, but once the immediate goals were obtained, the group fragmented into single or multi-family units, and individual family or small group hunting and gathering was the rule for the remainder of the year. There is no archaeological evidence to indicate the communal hunting group remained intact other than during the actual period of the buffalo drives.

In the ethnographic record, there is no evidence that even in post-horse times with larger populations and groups that the centralized leadership of the communal procurement period extended beyond the time of division of the kill. In describing the communal bison hunt of the Flathead, Turney-High (1937:118) noted: "Although the hunt had been communally or-

ganized, the kill thus far was private property, owned by the man whose arrow had killed it." Father DeSmet (Chittenden and Richardson 1905:1031) described a post-horse Assiniboine hunt in which 600 bison were killed in a pound and: "After the butchery, the skins and the flesh are separated into piles, and these piles are divided among the families, in proportion to the number of which they are composed." Henry (Coues 1897:520) claimed that each man's arrows were marked and after the animals were killed in the pound, each man then claimed his own. In describing the communal drive of the post-horse Gros Ventre, Flannery (1953:69) claims: "Nevertheless the operation was a collective rather than a truly cooperative one because, once the chase started, each man was on his own and had the right of disposal over whatever game he killed." For the Cree, Mandelbaum (1940:204) says: "At the buffalo pound all those encamped nearby were entitled to a share of the meat, even if they had not helped construct the pound." There are numerous other similar quotations from various sources, and all indicate that while the actual pound and killing was communal, the processing was not. Once the meat was divided, it was processed by the individual families. The archaeological evidence suggests similar procedures in the pre-horse period. The processing area for the Ruby pound consists of a number of similar but separated processing units. Processing was carried out at the family level. Storage and consumption were undoubtedly the same.

Ceremonial activity is another concomitant of communal food procurement activity. The jump and pound were different from the post-horse surround method in being tied to one location, but the surround was shrouded with supernatural observances as was the pound and trap. Fletcher and LaFlesche (1906:281) and Grinnell (1961:12-14) describe this for the Omaha and Pawnee respectively. Mandelbaum (1940:190-191) says the Cree pound was: "built under the supervision of a shaman. . . [empowered] to do so by a spirit helper. . . The tipi of the "maker" of the pound was placed beside the entrance. Here the shaman sang and smoked to invoke his spirit helpers." DeSmet (Chittenden and Richardson 1905:1028-1029) describes the supernatural activities connected with a post-horse Assiniboine pound. Gilmore (1924:209) describes an old Assiniboine drive

in North Dakota as follows: "... a large circle of bowlders, like tipi-circles of the camp, but ten paces in diameter. Also there is within the circle, near the west and northwest side, a large bowlder. The arrangement would suggest that this might have been a larger tipi for holding ceremonies in preparation for the buffalo-drive, and that the larger bowlder might have served as an altar." Another possible model for ceremonial activity during communal procurement is the caribou hunt among the interior north Alaskan Eskimo which sounds analogous to the situation with the buffalo. Spencer (1959:354) describes the activity as follows: "At the hunting camp, there was generally erected a temporary karigi, the base of ceremonial activity. Each hunting group... had its shaman who functioned to call the caribou." The caribou procurement seems especially relevant in that these animals were similar to the buffalo in being unpredictable in their seasonal movements, requiring alternative locations for pounds and traps.

The size of pounds described in the post-horse period are of varying size. We are usually left without precise measurements of pounds, but some estimates are known. Henry (Coues 1897:518) claimed the Assiniboine pounds were "60 to 100 paces or yards in circumference and about five feet in height" or about .06 to .16 acres. Hind (1860:355) described a Plains Cree pound in 1858, 120' in diameter (roughly .26 acre), which when one drive was completed, contained 240 dead buffalo. This pound was abandoned, supposedly, because the deteriorated condition of the animals made it easier to build a new pound rather than clean up the old one. A Gros Ventre pound seen by Mathew Cocking in 1772 was 7 feet high and 100 yards in circumference (Ewers 1949:356) or about .16 acre. A Sarcee pound was described as rectangular (Jenness 1938:16) but no actual dimensions were given. Umfreville (1790:160) gave a general description of pounds as being either circular or square depending on the group using them and gave a description of a pound 50 feet square or .06 acre. Peter Fidler of Hudson's Bay Company mentions a pound 50 yards long by 20 yards (about .21 acre) wide with one side formed by a low escarpment (found in Forbis 1960:64).

All of these pounds had diverging wings to funnel the animals into the opening. These were short fences and/or rows of bushes or other

markers which concealed persons who appeared at the proper moment to keep the animals headed in the proper direction. These are described as extending from one-half mile or more for the Sarcee pound (Jenness 1938:16) to one and one-half miles for a Gros Ventre pound (Ewers 1949:357), two miles for an Assiniboine pound (Coues 1897:519), and four miles for a Plains Cree pound (Hind 1860:358). Wissler (1910:48) generalizes for all pounds by claiming: "The lines near the pound were formed of materials similar to the walls just described. At a distance of about one hundred meters they gradually break into an open line of sticks. The lines are about two miles in length."

Another common feature of the pound was a drop-off either natural or artificial to prevent the animals from going back through the entrance. The rectangular Sarcee pound has one side banked with earth to provide an incline outside, with a sheer drop into the corral (Jenness 1938:16). Hind (1860:358) for the Plains Cree pound claims: "At the entrance to the pound there is a strong trunk of a tree placed about a foot from the ground and on the inner side an excavation is made sufficiently deep to prevent the buffalo from leaping back when once in the pound." Mandelbaum (1940:190), also describing the Plains Cree, illustrates a ramp of poles supported between two trees about 20 feet apart.

As a function of different terrain, the Piegan and Blood used the drive over the cliff, but if the cliff was not high enough to be lethal, a pen was built around the base (Grinnell 1892:229). The north Blackfoot pound (Ewers 1949:359) was built: "... toward the bottom of a downhill slope. . . . On the hill just above the opening of the corral a number of poles were placed on the ground crosswise of the slope and parallel to each other. . . . These poles were covered with manure and water which became slippery so that once the buffalo were in the corral they couldn't escape by climbing back up the hill." This pound is somewhat reminiscent of a Late Prehistoric site excavated by Kehoe (1967). Another feature mentioned in Ewer's account was sharpened stakes of cottonwood or birch laid over the lowest crosspoles of the pound with butt ends braced in the ground outside and the sharpened ends extending three or more feet inside to impale animals should they try to break down the corral. Henry (1809:295) described a corral with no jump-off

into it but with the opening covered with skins "let down by strings," after the animals were inside.

There are many details that remain obscure at the Ruby buffalo pound but there are comparisons that can be made with those known historically. In comparison, however, it must not be forgotten that horses allowed larger concentrations of people, larger pounds and more effective pounding situations.

From a standpoint of bison behavior, what remains of the drive lane at the Ruby site is functional, but it would have required long diverging wings to funnel the animals into the drive lane. The terrain has undoubtedly changed a good deal since its use, but several feet of logs and posts beyond those recovered in the excavation were probably present, and beyond this were probably drive markers with persons stationed alongside to keep the animals on the proper path. The bend in the drive lane is just enough to hide the actual trap from view until the animals were well inside the drive lane. In this bend is where the first projectile points were found, suggesting this is where shooting of the animals began. Probably, from the ethnological evidence, the fence was covered with hides or something so the animals could not perceive an opening. Hind (1860:357) observed a pounding situation for the Plains Cree in which: "...the Indians had driven about 200 buffalo into the enclosure, and were still urging on the remainder of the herd, when one wary old bull, espying a narrow crevice which had not been closed by the robes of those on the outside, whose duty it was to conceal every orifice, made a dash and broke the fence. The whole body then ran helter-skelter through the gap." Henry (1809:295) described a similar situation in which, "...the oxen made several attempts to force the fence; but, the Indians stopped them and drove them back, by shaking skins before their eyes." Rarely will cattle or buffalo attempt to force their way through a fence through which they cannot see. There was no jump-off into the Ruby pound and probably the opening there was also arranged to be closed with hides.

One side of the Ruby pound is several feet lower than the other (Fig. 1), and this was where most killing occurred. The two parallel rows of posts were probably filled with logs and brush to a height of five to seven feet. The post holes on the top side, if there were any present, have disappeared through erosion. The pattern

of remaining post holes and the original terrain suggest that it may have been vaguely oval and possibly 50 by 30 feet. The high side of the corral was likely nothing more than logs piled along the top of the bank of the arroyo. At least four of the post holes inside the pound structure were at an angle, suggesting they may have been used to hold sharpened stakes in the manner analogous to that of the north Blackfoot (Ewers 1949:359) and were intended to impale the animals.

The Ruby buffalo pound was obviously not designed to handle large numbers of animals at any one time. Thirty to forty buffalo would seem to be about the maximum number the facilities would handle, but less than twenty-five would be more reasonable.

Man power requirements can only be estimated. The hypothesis presented here is that a pre-horse buffalo jump, trap or pound would all have required about the same number of persons to operate. We know that buffalo jumps and traps or pounds were in operation on the Powder River Basin in immediate post altithermal times (Bentzen 1962; Frison 1968b, 1970) and that both continued until the end of the Late Prehistoric period. It has been postulated on the basis of the size of a campsite at a Late Prehistoric period jump (Frison 1967b:28) that at least 24 grown males were present. This seems like a minimum number for a communal bison procurement operation, and up to 35 or even 40 does not seem excessive. Operation of the Ruby pound would have had about the same requirements. It would have required several men who were reliable and familiar with buffalo handling on each side of the drive lane and several others to move the herd into proper position. There were probably others along the drive lane at the pound to start spearing the animals at the entrance to the trap. A reconstruction of the operation seems to have been a similar but smaller one than those described for the historic period.

CONCLUSIONS

In this part of the Northwestern Plains, communal bison procurement in the fall of the year for winter food storage appears to have been part of a cultural system that existed relatively unchanged for a period of about 4,000 years of post-altithermal time. This type of operation brought about the largest consolidation of people in the yearly round of activi-

ties. During the remainder of the year, the society fragmented into single or multi-family groups in order to better exploit the ecosystem. The size of the group and time of the year of bison procurement were determined largely by the behavioral characteristics of the buffalo. There were minimum and maximum man power requirements. In the fall after the rutting season, buffalo could be handled successfully without horses, and optimum conditions for processing meat were present.

During this period of post-altithermal time, communal procurement was an important part of the instituted economy. It provided food for storage for periods in the winter months when food procurement was difficult if not impossible. Typological changes appear through time in recovered artifact assemblages, but very little of this can be interpreted as functional. During the Late Prehistoric period, there was a trend away from pounds and an emphasis on jumping. More communal operations occurred in the latter period, but they do not appear more complex than the earlier ones. It was the introduction of the horse into the system, along with other European goods and ideas, that brought a change in Plains Indian culture and an end to the buffalo.

The Ruby site is a late Middle period buffalo pound used over a period of several years. There were probably other pounds or jumps nearby to allow for years when buffalo were not available locally in sufficient numbers. The operation can be understood in terms of pounds known and described historically and is a variation of other trapping methods known over 2,000 years earlier in the same area. Successful operation required a larger than normal group of people and temporary centralized authority to direct the operation. Ceremonial activity was associated and manifest by a special structure alongside the pound. The meat obtained was divided and then processed in separate but contiguous units in the same general area but away from the pound. The winter camps were probably in more favorable locations of which there are many within a few miles.

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GEOLOGY OF THE RUBY SITE AREA, WYOMING 48 CA 302

JOHN ALBANESE

ABSTRACT

Quaternary sediments in the Ruby site area are of post-altithermal age. Two past alternating cycles of deposition and erosion are evident. The oldest depositional unit contains an archaeological site which yielded a radiocarbon date of A.D. 280 ± 135 years. This older formation was deposited in post-Kaycee—pre-Lightning time. A stratigraphic unit of this age has not been previously reported in the Powder River Basin and is herein named the South Butte formation. The youngest depositional unit in the area is the Lightning formation. Erosion and downcutting began about 1900 and has continued to the present.

Casper, Wyoming
March, 1970

The Ruby site is located in the NE 1/4 of Section 29, Township 43 N., Range 75 W., in Campbell County, Wyoming (Fig. 1). It is situated on the margins of a valley, 40 to 50 feet deep and 150 to 250 feet wide, which is drained by an unnamed tributary of Cottonwood Creek. The latter is in turn a part of a tributary drainage network which drains northwest into the Powder River 20 miles northwest of the Ruby site area.

The subject tributary heads 1-1/3 miles northeast of the Ruby site area and traverses the essentially flat-lying Wasatch formation of Eocene age, which is a continental sequence consisting of alternating sandstones, siltstones, shales, and a few thin coals. In the Ruby site area, Wasatch outcrops consist of thick, tan to buff, fluvial sandstones with an occasional thin interbed of gray, lignitic shale. The general area has been moderately eroded and active erosion and downcutting is presently occurring.

GEOLOGY

Late Quaternary, post glacial sediments are present along the drainage system in the Ruby site area. The stratigraphy is described in Table 1, and the mode of deposition is shown in Figs. 2 and 3. All of the Quaternary sediments were locally derived from the Wasatch formation. Quartz sand constitutes the bulk of the sediments which are unconsolidated to semi-consolidated. All sediments are calcareous and will react with hydrochloric acid. However, a calcareous cement is not discernible under the microscope, nor are there any calcareous cementation zones on the outcrop.

Two distinct formations are present in the area. The youngest is the Lightning formation (Leopold and Miller 1954) which occupies the