THE CARTER/KERR-McGEE PALEOINDIAN SITE: CULTURAL RESOURCE MANAGEMENT AND ARCHAEOLOGICAL RESEARCH

George C. Frison

A decade of intensive archaeological survey of the Powder River Basin in Wyoming has revealed one stratified Paleoindian site along with several thousand sites of later age. This site is only a remnant of a much larger one. It has four cultural levels that include Clovis, Folsom, Agate Basin-Hell Gap, and Alberta-Cody respectively, with intervening sterile deposits. The site location and the taphonomics of the bone bed in the Alberta-Cody level suggest that the site was associated with the procurement of large animals. Interdisciplinary investigation of the site indicates that past geologic activity is largely responsible for the scarcity of Paleoindian sites in the basin. The history and basic philosophy of cultural resource management in this area are reviewed. Currently, land ownership is divided between federal and state agencies and private operators, such that the surface may be privately owned while the subsurface is federally owned. The argument is made for a future cultural resource management program for the Powder River Basin that is strongly oriented toward research in contrast to the present policy of inventory and avoidance of archaeological sites.

The Powder River Basin in Wyoming and Montana contains a significant portion of the energy resources in North America. Consequently, few areas of North America have been more heavily affected by extraction of natural resources in the last decade. Rapid development entailed an experiment in cultural resource management (CRM), in which there was insufficient time for careful planning to allow archaeological clearances for strip mining areas. Surveys and mitigative excavation of archaeological sites were performed only on areas of immediate earth disturbance. The formulation of long-term research objectives was not possible, due largely to the lack of information about the number, distribution, and age of archaeological sites. A concurrent part of this experiment in archaeology was the rapid growth of contract archaeology that developed in response to the needs of CRM.

One of the early surface surveys for clearance of a strip mining area revealed what later proved to be a small but stratified Paleoindian site. It was a site that was being rapidly looted; a significant portion of the site had been destroyed between initial discovery and testing. The writer recommended complete excavation. CRM policy for federal agencies in the Powder River Basin at the time (1976) was not yet firmly established, and the recommendation for immediate excavation was approved. The mining companies involved agreed to cover the site with enough overburden to discourage further looting until excavation was possible.

Seven subsequent years of intensive surface survey throughout the Powder River Basin have as yet failed to reveal another buried, in situ Paleoindian site, although a total of about 3,000 archaeological sites of more recent age have been recorded. This raises numerous questions concerning Paleoindian research and cultural resource management and both topics are subjects of this paper.

ENVIRONMENTAL SETTING

That part of the Powder River Basin within Wyoming covers an area of over 33,670 km^2. Its official boundaries were established for the purposes of energy resource management and they extend beyond the drainage of the Powder River. As a result, the Powder River Basin consists of the land in Wyoming between the Big Horn Mountains and the Casper arch on the west; the Laramie

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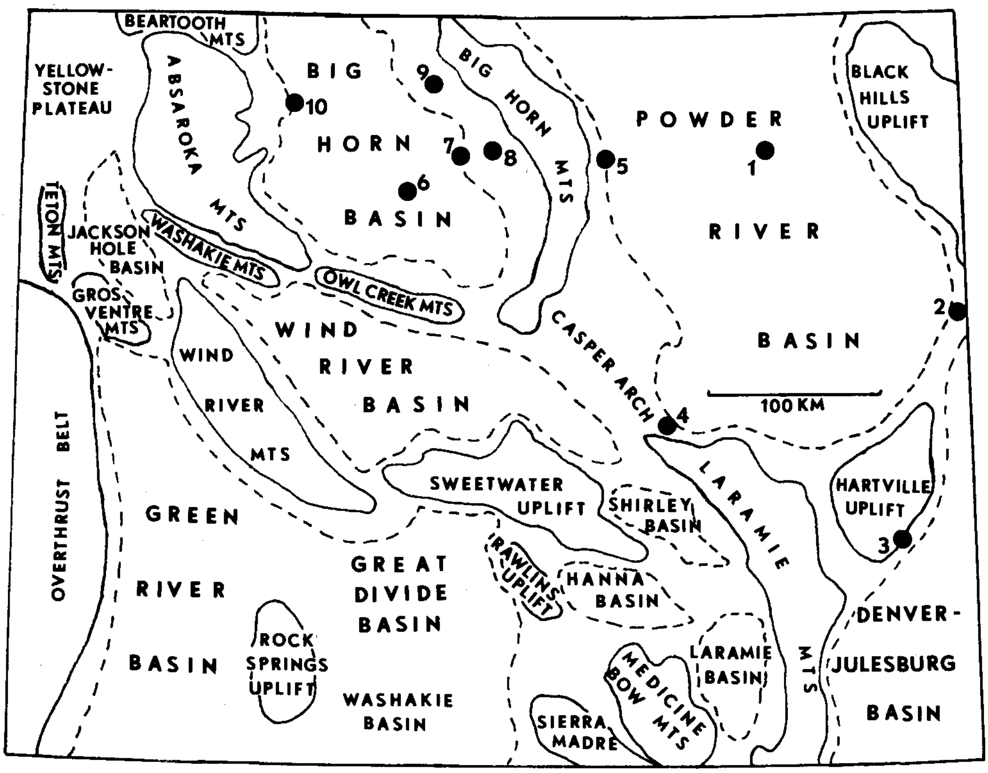

Figure 1. Physiographic areas of Wyoming and locations of Paleoindian sites with assemblages relating to the Carter/Kerr-McGee site: 1. Carter/Kerr-McGee, 2. Agate Basin (Frison and Stanford 1982), 3. Hell Gap (Irwin-Williams et al. 1973), 4. Casper (Frison 1974), 5. Sister's Hill (Agogino and Galloway 1965), 6. Colby (Frison 1976a), 7. Medicine Lodge Creek (Frison 1976b), 8. Laddie Creek (unpublished), 9. Hanson (Frison and Bradley 1980), 10. Horner (Jepsen 1953).

Mountains and Hartville Uplift to the south and the Black Hills Uplift to the east (Figure 1). In addition to the drainage of Powder River, the area includes parts of the drainages of the North Platte, Cheyenne, Belle Fourche, Little Missouri, and Tongue rivers.

Excluding rock outcrops and steep slopes, there is a nearly continuous cover consisting of a number of species of grasses. Changes in soils and moisture over short distances determine the vegetative cover at any given spot. Sagebrush appears as a dominant part of the vegetative cover in the better drained areas. Yearly average precipitation over the past several decades is 40 cm/yr. Average annual temperature is 7.5°C with January the coldest (−5.6°C average) and July the warmest (22.2°C). A west-northwesterly wind with an average velocity of 19.3 km/hr blows much of the time and is a major factor in keeping large areas free of winter snow so that grazing animals may survive the severe winters. Pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), and jackrabbit (*Lepus* spp.) comprise the only large native fauna found in the area today although one commercial herd of buffalo (*Bison bison*), numbering around 3,000, is maintained in the area under open range conditions along with several much smaller herds.

THE CARTER/KERR-McGEE SITE

The stratified Paleoindian site (48CA12) was named Carter/Kerr-McGee (CKM) because the boundary separating leases of these two mining corporations split the site. It was discovered in 1975, tested in 1976, and completely excavated in 1977. A brief report on the site was prepared to satisfy cultural resource management requirements (Reiss et al. 1980).

Figure 2. Aerial view of the Carter/Kerr-McGee site and locality.

The site is located in the eastern Powder River Basin (Figure 1) which is best characterized as a broken, dissected plain with low topographic relief. The site area is in the main strip mining area where the coal veins are closest to the surface. Coal veins believed to have burned out in late Pliocene or early Pleistocene times have left large areas of clinker and scoria outcrops. Depressions caused by land subsidence into burned-out coal veins have left shallow, intermittent ponds and lakes up to .8 km in diameter.

The CKM site location is near the head of an intermittently wet arroyo that extends southward from one of these lake beds (Figure 2). Maximum depth is about 12 m. The sides are steep, the bottom flat with a thick cover of grass. Knickpoints become a common feature of the arroyo bottom as the gradient increases in the immediate vicinity of the site (Figure 3). Seepage water presently keeps the arroyo bottom wet to within about 100 m of the site location for most of the spring and summer during most years.

Site Stratigraphy

The pre-Altithermal sediments containing the stratified Paleoindian levels are only a remnant of what was at one time a much larger site. Headward erosion of the arroyo subsequent to the Paleoindian activity removed most of the site. The sediments down slope from those containing the Paleoindian levels are of post-Altithermal age. Bedrock is exposed upslope from the pre-Altithermal deposits and in the bottom of the arroyo (Figure 3). The present cycle of headward erosion was progressing rapidly toward the remaining site deposits at the time of its discovery.

The site deposits on the west side of the arroyo were the most extensive and, in addition, were mostly stratified. Toward the north, on the west side of the arroyo, the strip of sediments narrowed, and only a few redeposited artifacts of the Cody Complex remained along with small amounts of bone scrap and tooth enamel. On the east side of the arroyo, the strip of remaining site sediments

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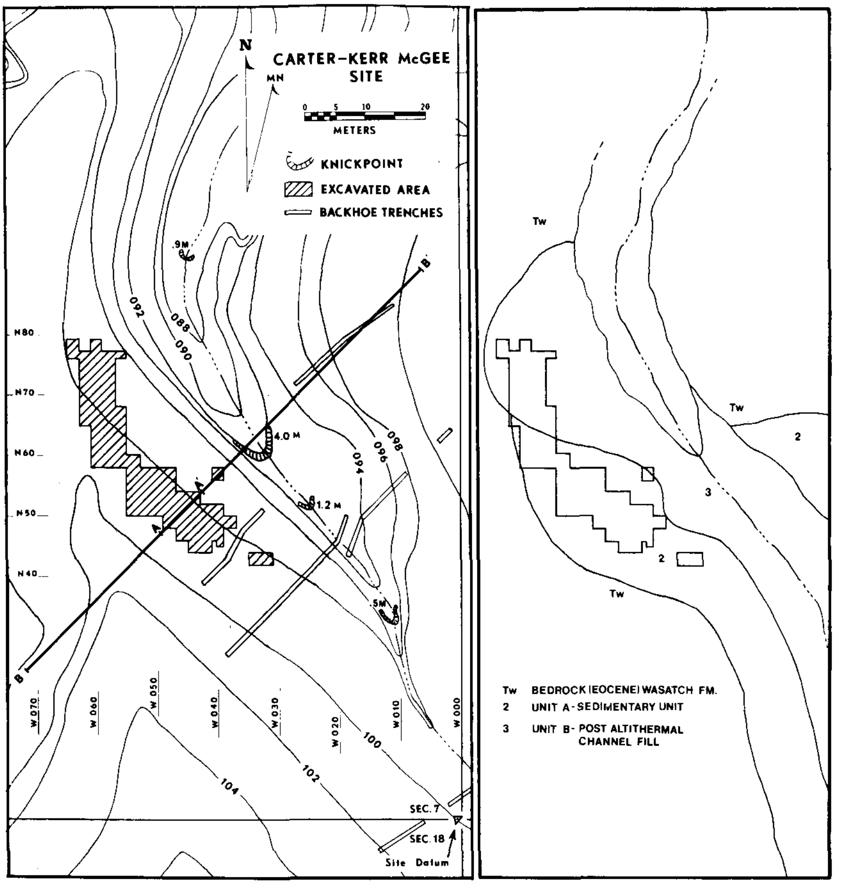

Figure 3. Topographic and surface geologic map of the Carter/Kerr-McGee site. Unit A is composed of pre-Altithermal alluvial and colluvial deposits and, in addition, contains the in situ Paleoindian components.

was even narrower and contained only a few scraps of redeposited bone and tooth enamel. It is assumed that at one time the site occupied all or at least most of the area between the two strips before deposits there were nearly destroyed by headward erosion.

Figure 4 illustrates the relationship between the arroyo and the site. On the west side of the arroyo, four separate and distinct Paleoindian levels are separated by sterile deposits. As is shown by the profile, the site deposits are in the form of a wedge-shaped block of sediment perched on top of sandstone bedrock that slopes in the direction of the present arroyo. The cultural levels are all essentially parallel to each other and dip in the same direction, but not as steeply as the bedrock. Consequently, each cultural level decreases in areal extent with depth and also age (Figures 4 and 5).

THE CODY-ALBERTA CULTURAL LEVEL

The only feature in the entire site that could be regarded as a bison bone bed occupied an area roughly 16 m by 5.0 m in the Cody-Alberta level. The natural limits of the bone bed were reached on the southeastern and western sides. To the north, adjacent to the arroyo, erosion had removed an unknown quantity of the bone bed. Of the bone that survived, about 12 m^2 or 14% was removed by recent digging (Figure 5). The bone bed is believed to be of Cody age since both Eden and

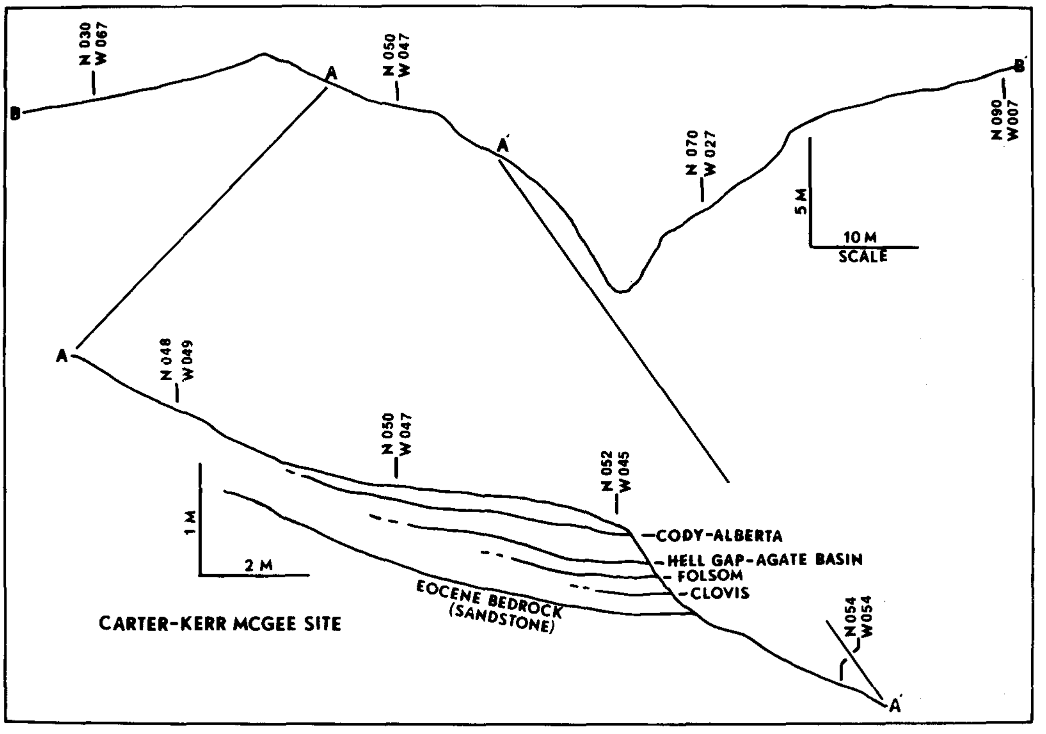

Figure 4. Profile map through the Carter/Kerr-McGee site.

Scottsbluff points were recovered among the bones, while the Alberta points were recovered at the bottom of the bone bed.

By the time of the excavation, the bone had reached an advanced stage of deterioration. This was probably due to its proximity to the present ground surface (15–25 cm) and also to a loose, sandy matrix of decomposed sandstone bedrock which enclosed it. A thin (1–2 mm) covering of caliche adhering to the bottom of interior and exterior surfaces of bones was a significant factor in allowing even a small measure of preservation. The caliche deposits on bone surfaces thickened progressively with the depth of the cultural strata and were as much as 5 mm thick in the Clovis level.

Bone deterioration limited both the quantity and kind of taphonomic analysis possible; only the Cody-Alberta bone bed provides an adequate sample for meaningful study. Some statements can be made concerning the cultural systematics of the procurement operation and the biological nature of the animals involved. Since no charcoal was recovered from the Cody-Alberta level, two attempts were made to date the bison bone. Both were unsuccessful; a date on unaltered long bone was 6950 ± 190 B.P.: 5000 B.C. (RL-737) and another on charred bone produced similar results. Both are considered too young on the basis of dates from other sites of the Cody Complex. Bone dates from this region generally tend to be less reliable than charcoal dates. Charcoal dates believed reliable from the Cody component at the Horner site, the type site of the Cody Complex are: 8750 ± 120 years: 6800 B.C., 8840 ± 120 years: 6890 B.C. (Haynes 1967:272); 9390 ± 75 years: 7440 B.C. (SI-4851).

Seasonality Determinations

Tooth eruption in large ungulates including bison is systematic and the age of young animals up to three years old in particular can be calculated quite closely through observations of tooth eruption and wear (Frison and Stanford 1982; Frison et al. 1976; Reher 1970, 1973, 1974). Therefore, if the

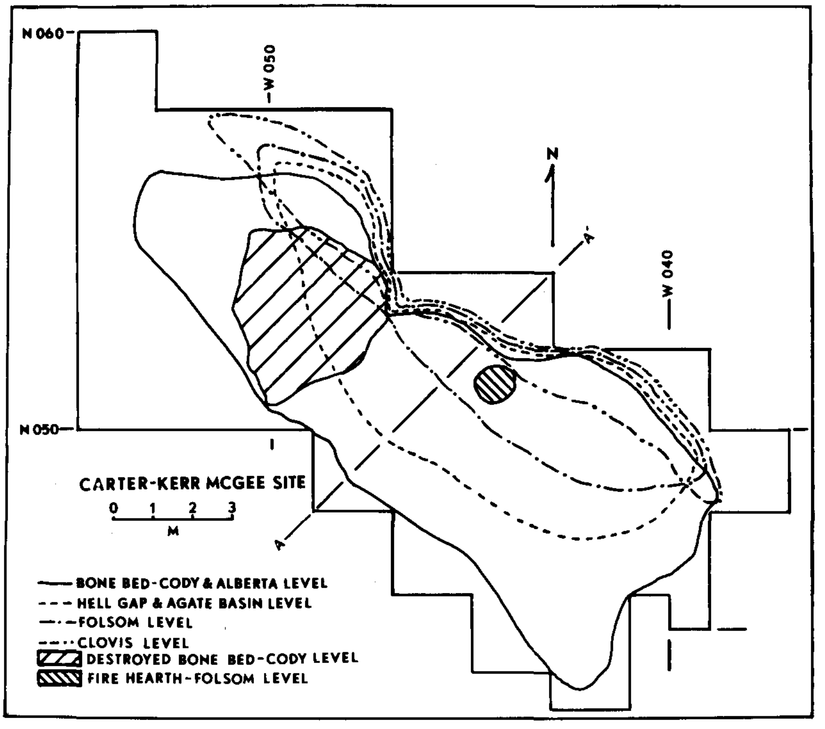

Figure 5. Areal extent of Paleoindian components.

sample is of proper size and content, positive statements can be made about the kind of death assemblage represented (catastrophic or attritional) and the time of year in which the animals were killed. Such data can then provide meaningful information on cultural systematics. Tooth eruption and wear indicate that the bison in the Cody-Alberta bone bed fall into age groups of about .6–.7 years, 1.6–1.7 years, 2.6–2.7 years, etc. on up to about 12.7 years of age. Tight age grouping such as this is indicative of a catastrophic kill or, if more than one kill was involved, all occurred within a short period of time. It could also represent occurrences over more than one year but at the same time of the year.

The calving period peaks from late April to early May at present and probably also did in Plano times. If so, the animals were killed between early December and mid-January. The kill therefore seems to have been a cold weather operation. The partial dentitions of two fetal specimens compare closely in age to fetuses of modern bison of about 6–7 months. This is a very small sample. However, the extremely deteriorated and fragile nature of these fetal specimens leaves open the possibility that fetuses in less developed stages did not survive the agents of deterioration. The two recovered specimens might represent only the most mature end of the age range of fetal material. They would also indicate a midwinter kill.

Butchering and Processing

Poor bone preservation resulted in the loss of marks that normally result from stone butchering tools. Articulated appendicular skeletal units include 47 from the front leg and 52 from the rear leg and vary in number from two elements to nearly complete limbs. In contrast there were only 27 articulated axial skeletal units. This includes eight rib units; in each case the ribs are in proper sequential position but all had been separated from the rib heads. It is suggested that these units had been chopped or broken loose and the overlying flesh subsequently removed, but not the flesh

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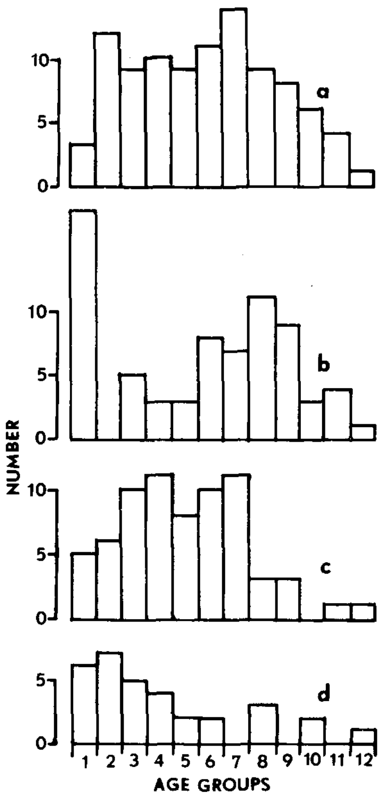

Figure 6. Age grouping of bison from the Hawken site (a), Casper site (b), Agate Basin component at the Agate Basin site (c), and the Cody component at the Carter/Kerr-McGee site (d).

between the ribs. The rib heads presumably remained with the thoracic vertebrae and were taken elsewhere. Long bones were not extensively broken for marrow. It is suggested that front legs were simply cut loose from the carcass while hind legs were removed in several ways including breaking the pelvis, disarticulating the proximal femur from the pelvis, and breaking the femur shaft. Relatively little evidence of carnivore or scavenger modification of bone can be detected.

A large number of skulls were left at the bone bed, all of them badly deteriorated, leaving only the teeth in nearly every case. An atlas vertebra and one skull and both axis and atlas on another were apparently articulated. Mandibles fared only slightly better than the skulls; most of the lower teeth, although relatively well preserved, required special care and treatment for intact removal. The relative scarcity of articulated axial skeletal elements seems an anomaly in comparison to other bison kill sites. It must be remembered, however, that the complete bone bed was not available for observation.

The composition of the bone bed does not suggest that this was the actual location of the kill. Complete or nearly complete animal skeletons such as have been found in other kill locations (see, for example, Wheat [1972] and Frison [1974]) were lacking. However, the kill location was probably close by. This bone bed is believed to represent dismembered carcasses deliberately removed from the kill area and subsequently stacked. One hypothesis is that this was a pile of butchered units that had been preserved for future use by freezing; they would have been stripped of meat as needed by the hunting group that was camped nearby. The hypothesis of the frozen meat cache is based on the cold weather time of the year of a number of Paleoindian kills. Drying of the meat was not practical at that season (Frison 1982). This would contrast with the Late Prehistoric bison kills which were usually made in late summer or early fall when drying of meat was easily accomplished

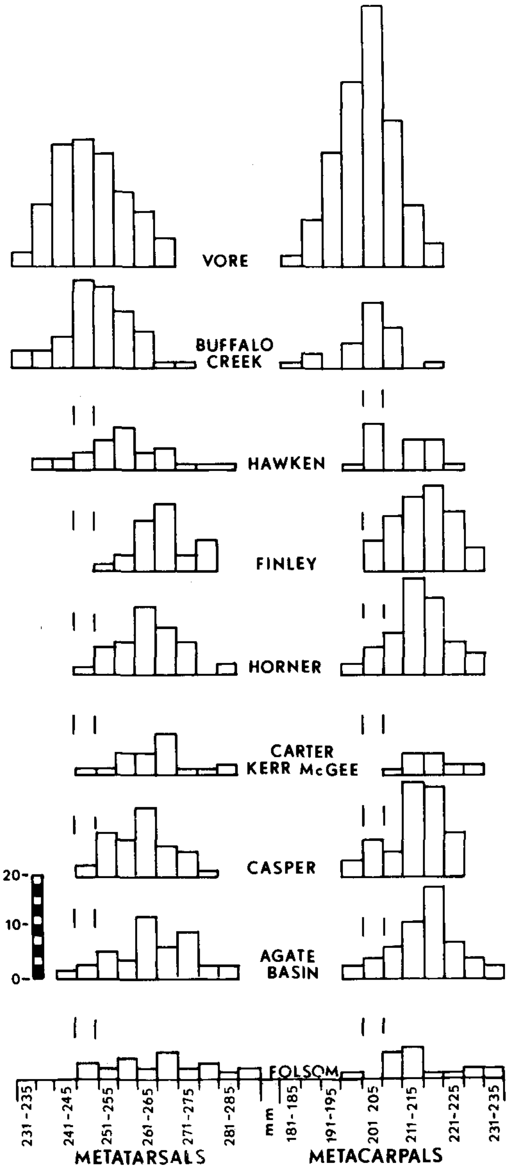

Figure 7. Bison metatarsal and metacarpal lengths; Vore—Late Prehistoric (Reher and Frison 1980), Buffalo Creek—Middle Plains Archaic (Miller 1976, Frison 1978a), Hawken—Early Plains Archaic (Frison et al. 1976). Finley—Cody Complex (Moss et al. 1951), Horner—Cody Complex (Jepsen 1953), Carter/Kerr-McGee—Cody Complex, Casper—Hell Gap (Frison 1974), Agate Basin—Agate Basin (Frison and Stanford 1982), Folsom—Folsom (Figgins 1927).

(see Frison [1967]). Burned and calcined bone fragments were present in the bone bed but no hearths or burned areas could be detected.

Bison Population Dynamics

The Cody-Alberta bone bed contained at least 47 animals, determined by the astragali count. The latter bone preserves best of all skeletal elements because of its relative density and compact shape but even they were too badly deteriorated to allow the measurements of volume which have been utilized in other contexts (Lorrain 1968; Zeimens and Zeimens 1974). If the sample from the Cody-Alberta bone bed is a representative sample of the bison population, it approximates a catastrophic kill reasonably well (Figure 6d). Young animals are best represented, with decreasing numbers in the older age groups.

Not all age groups are represented in the sample of CKM bison dentitions, probably because of the limited sample size. However, in the first four age groups which are reasonably well represented, the yearly tooth attrition rate is very close to 5 mm per year. This compares quite well to rates of wear in other bison kill sites dating from Paleoindian, Early Archaic, and Late Archaic times (see for example Frison and Stanford [1982:250–251], Frison [1978b:49], and Clark and Wilson [1981: 63–64]). However, in some Late Prehistoric sites, yearly tooth wear is less (see Reher [1973:101], Reher and Frison [1980:69–70]). The life span of a bison or any grazing animal is directly affected by rates of tooth wear (Frison and Stanford 1982:240).

Age determination of bison through tooth eruption and wear is discussed in detail in a number of reports (see Frison and Reher [1970], Frison et al. [1976:39–41], Frison and Stanford [1982:240–260], Reher [1970], and Reher and Frison [1980:59–94]).

Bison Taxonomy

Skulls, upon which sub-specific determinations of fossil bison depend heavily, were too badly deteriorated to provide meaningful data. However, a number of metacarpals and metatarsals were complete enough to provide reliable maximum length measurements. These measurements indicate that the bison metapodia from the Cody-Alberta level compare well in length to other bison of Paleoindian age and are significantly longer than the metapodia of bison of the later Archaic and Late Prehistoric periods (Figure 7). Metapodia reflect well the size differences of the bison.

Bison Procurement

There is no remaining evidence upon which to establish any geomorphic feature of Paleoindian age at the CKM site that either formed a trap outright, or aided in the formation of one. However, although the present topography of the immediate site area has changed, the general character of the surrounding country probably has not changed significantly within the time period of recorded human use of the CKM site. The lake bed to the north was present in Paleoindian times and arroyos draining into it were also present. The situation was ideal for regular and systematic trapping of bison. The animals would have been attracted to the open areas around the edges of the old lake which would have supported a thick vegetation cover. They would have tended also to move out away from the lake in patterned ways as they grazed the surrounding country. Arroyo bottoms are always attractive to large herbivores since feed there is relatively lush.

The present contention is that the hunters were able to urge small bison herds up the bottom of a steep-sided arroyo until either a knickpoint, an artificial barrier, or a combination of both was reached, constraining the animals enough so they could be killed. Winter conditions could have also enhanced the effectiveness of the arroyo trap. Snow cover combined with frozen ground would have constrained the maneuverability of the bison more than that of the hunters. The carcasses were reduced to manageable units and piled nearby where they were frozen for later consumption. Perhaps the topography of the actual kill location was unsuitable for piling the butchered units, or subsequent kills were planned which required their removal. The archaeological record on the High Plains testifies positively to the effectiveness of the arroyo bison trap (Frison and Stanford 1982; Frison et al. 1976; Fulgham and Stanford 1982; Miller 1976).

The landforms and the time of year involved here approximate quite closely the situation at the Hawken site (Frison et al. 1976) in which extinct sub-species of bison were repeatedly killed in a natural arroyo trap around 6,500 years ago. At the CKM site, erosion had removed the evidence of the actual kill location while at the Hawken site, part of the original kill location in the old arroyo bottom was preserved with the bison remains intact. Although bone beds comparable to that in the Cody-Alberta level at the CKM site are lacking in the underlying cultural levels, it is still believed

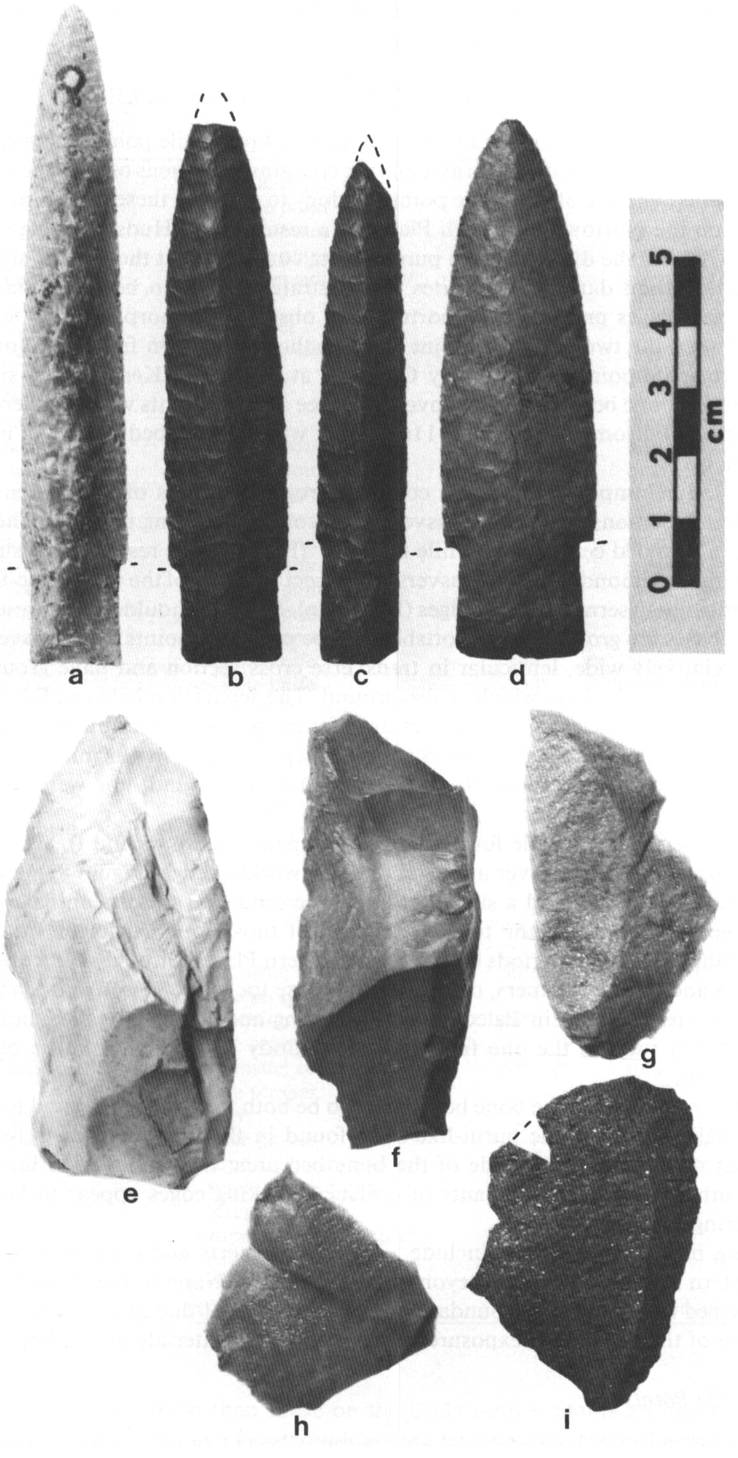

Figure 8. Eden (a–c) and Scottsbluff points (d) and tools (e–i) from the Cody component.

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that the cultural evidence in all levels reflects use of the site as a favored spot for trapping bison and possibly also other animals to a lesser extent.

ARTIFACTS FROM THE CODY-ALBERTA LEVEL

The artifacts from the Cody-Alberta level consists of 17 projectile points and a small tool assemblage. Typologically the projectile point assemblage contains specimens of both the Cody and Alberta cultural complexes. The use of projectile point typology to separate these two complexes is on much firmer ground on the Northwestern High Plains as a result of the Hudson-Meng site investigation (Agenbroad 1978) and the discovery of a pure Alberta component at the Horner site (Frison 1978a: 182–183). Radiocarbon dates at both sites demonstrate Alberta to be older than Cody and the Horner site assemblages provide an opportunity to observe the morphological and technological differences between the two projectile point types as they are known from the Northwestern High Plains. The projectile points of the Cody Complex at the Carter/Kerr-McGee site were directly associated with the bone bed described above, and three Alberta points were recovered at the bottom of the bone bed. A Folsom point (Figure 11a), which will be described later, was also recovered in the Cody bone bed.

The CKM Cody Complex assemblage contains projectile points of both Eden and Scottsbluff types. Eden points demonstrate both transverse and collateral flaking patterns. The former (Figure 8a) resulted in a rounded center ridge while the latter (Figure 8b, c) resulted in a sharp center ridge and consequently a diamond-shaped transverse cross section. Two of the transverse-flaked specimens also demonstrate finely serrated blade edges (Figure 8a). Definite shoulders are present in both cases and stems and bases are ground. Two Scottsbluff I type projectile points were also recovered (Figure 8d); they are relatively wide, lenticular in transverse cross section and have ground stems which expand slightly toward the base which is also ground. The separation between Eden and Scottsbluff and the variants within each type is useful mainly for purposes of description, since they present a continuum of variation of a single type rather than separate types (Wormington 1957:266, 267). Neither examples of the Scottsbluff II and III variants were found, nor were the familiar Cody knives.

Tools in the assemblage include four large side scrapers (Figure 8e and f), a side scraper with a sharp but strongly buttressed graver at one end of the working edge (Figure 8g), a flake tool with a use retouch only (Figure 8i), and a single graver made on a thin percussion flake (Figure 8h) (see Table 1). Except for the latter, the tools are typical of those found in bison butchering contexts throughout all the prehistoric periods on the Northwestern Plains. Strongly-buttressed graver points on end scrapers and/or side scrapers, or as single purpose tools (see Frison and Stanford [1982:113, 114, 120, 121]), are common in Paleoindian butchering and processing sites, but the utility of a delicate graver tool such as the one from the CKM Cody level (Figure 8h) is questionable in a butchering tool kit.

The few flakes recovered in the bone bed appear to be both tool sharpening and tool and projectile point impact flakes. In fact, one burin-like flake found in the bone bed was refitted to a broken projectile point recovered just outside of the bone bed area; it is believed to have resulted from impact. Two other flakes with remnants of unifacial working edges appear to have been broken from tools during heavy use.

Stone flaking materials (Table 1) include a variety of cherts and quartzites that very strongly suggest an eastern origin toward and beyond the Black Hills. None of the artifacts recovered from the Cody bone bed is of the locally abundant porcellanite. Exact lithic sources cannot be determined, mostly because of the number of exposures of similar stone materials over a large area.

Alberta Projectile Points

Three projectile points belong unmistakably in the Alberta Complex. One is relatively wide with prominent shoulders and a wide stem (Figure 9f). This specimen is reminiscent of the original Alberta type (Wormington 1957:133–135; Wormington and Forbis 1965) while the other two (Figure 9d and e) are longer, narrower, but still with prominent shoulders. Stems and bases are ground but

Table 1. Artifact Data for the Carter/Kerr-McGee Site.

Figure No.	Designated Type	Functional Type	Edge Angle	Material	Maximum Th. (mm)
8a	Eden	projectile point		chert	7.0
8b	Eden	projectile point		quartzite	8.5
8c	Eden	projectile point		chert	6.7
8d	Scottsbluff	projectile point		quartzite	9.0
8e	retouched flake	composite; side scraper/ notch	42°/63°	chert	12.3
8f	retouched flake	side scraper	63°	chert	18.6
8g	retouched flake	composite; side scraper/ graver	54°	quartzite	5.9
8h	retouched flake	graver		quartzite	3.8
8i	unretouched flake	cutting tool	25°	quartzite	4.1
9a	Hell Gap	projectile point		porcellanite	6.8
9b	Hell Gap	projectile point		quartzite	7.1
9c	Hell Gap	projectile point		chert	8.4
9d	Alberta	projectile point		porcellanite	7.7
9e	Alberta	projectile point		quartzite	6.2
9f	Alberta	projectile point		silicified wood	8.5
10a	Agate Basin	projectile point		porcellanite	6.6
10b	Agate Basin	projectile point		quartzite	7.1
10c	Agate Basin	projectile point		quartzite	6.0
10d	biface	possible knife	44°	chert	9.2
10e	biface	possible knife	53°	porcellanite	7.8
10f	retouched flake	convex sidescraper	54°	quartzite	10.0
10g	endscraper	double spurred, asymmetrical end scraper	74°	chert	8.4
10h	endscraper	double spurred end scraper	77°	chert	5.8
11a	Folsom fluted	projectile point		porcellanite	4.8
11b	channel flake			quartzite	2.8
11c	channel flake			chert	1.9
11d	biface	projectile point preform		chert	3.4
11e	channel flake			chert	2.8
11f	channel flake			quartzite	2.7
11g	retouched flake	composite; convex/straight side scraper/graver	60°/62°	quartzite	12.8
11h	retouched flake	composite; double straight side scraper	48°/62°	quartzite	7.1
11i	retouched flake	composite; convex/straight side scraper	58°/60°	quartzite	4.3
11j	retouched flake	graver		chert	2.1
11k	retouched flake	double graver		quartzite	4.2
11l	endscraper/graver	composite; asymmetrical single spurred end scraper/graver	76°	quartzite	7.7
11m	retouched flake	composite; side scraper/ cutting tool	58°/23°	chert	5.7
13a	Clovis	projectile point		chert	5.8
13b	Clovis	projectile point		porcellanite	6.7

the flaking patterns are less refined than those on the Cody points. Stems are thinned by about 1 mm on each face between the base and the shoulders. These two specimens closely resemble those from the Alberta component at the Horner site (Frison 1978a:Figure 5.21) for which there are now two radiocarbon dates of 10,060 ± 220 years: 8110 B.C. (I-10900) and 9875 ± 85 years: 7925 B.C. (SI-4851A).

THE HELL GAP-AGATE BASIN LEVEL

Thirty-five centimeters below the Cody-Alberta level was a second cultural level containing scattered bison bone and projectile points of both the Hell Gap and Agate Basin types. Although unmistakable examples of both projectile point types were present, no stratigraphic separation between the two was possible. Most of the distal end and the base of a Hell Gap specimen (Figure 9a) and the distal end (Figure 9b) of another were recovered in situ while a nearly complete specimen (Figure 9c) and two more distal ends were recovered on the talus slope below the site. One Agate Basin base (Figure 10c) was found in situ and a nearly complete specimen (Figure 10a) and most of another (Figure 10b) were recovered from the talus below the exposed cultural strata.

Several hundred bone fragments were recovered in this component; all are bison except two shaft fragments of a smaller animal, probably deer or antelope. Identifiable bison bone includes deliberately broken pieces of most skeletal elements. Petrous parts of two skulls and a few broken teeth were recovered but there was nothing that could offer any kind of seasonality evidence. Also present in the cultural level was the point of an antler tine, probably deer, 34 mm in length. It appears to have been broken off after a shallow groove was cut part way around the tine. It could be a discard of manufacture but it could also have been an atlatl hook.

Tools

Four bifaces probably represent some kind of knife (Figure 10d and e). One of these (Figure 10d) was of material identical to that of one Hell Gap point (Figure 9c) and from this it is believed that all four are Hell Gap tools. Irwin and Wormington (1970:28) described a Hell Gap knife type which has one slightly convex blade edge and a distinct shoulder on the opposite blade edge. While this particular knife style does not appear in the Hell Gap assemblage at the CKM site, all four of the CKM specimens might possibly be regarded as a slightly variant style of that Hell Gap knife. They are lenticular in cross section, and what are presumably the working ends of both demonstrate a continued resharpening which resulted in an abrupt change in the angle of one blade edge. Other tools include a side scraper (Figure 10f) and two end scrapers (Figure 10g, h) (see Table 1).

Flakes

A total of 1,267 flakes from the Hell Gap-Agate Basin level includes a small number resulting from biface reduction, but most are small pressure flakes from tool and projectile point manufacture. The raw material sources are local porcellanites and silicified wood along with quartzites and cherts that are believed to originate in the southern Black Hills and the Hartville Uplift.

THE FOLSOM LEVEL

The Folsom level averaged about 16 cm below the Hell Gap level with a distinct sterile level between. While the areal extent of the Folsom level is less than that of the overlying levels (Figure 5), a number of diagnostic stone artifacts were recovered. Broken bison bone similar in size and distribution to that in the overlying Agate Basin-Hell Gap levels was present in the Folsom level along with parts of a femur, tibia, and metatarsal of a size that compares well with a mature male mule deer (*Odocoileus hemionus*). An area 95 × 83 cm was occupied by an in situ fire hearth (Figure 5) in a shallow depression with a maximum depth of 6 cm. A small charcoal sample was obtained from within the hearth and several calcined bones and fire-fractured flakes and stone artifacts were recovered in and around the edges. A radiocarbon age of 10,400 ± 600 years: 8450 B.C. (RL-917), obtained from the charcoal sample is within the range of acceptable Folsom ages (Frison 1978a:23; Haynes 1967).

Folsom Projectile Points and Manufacture Technology

A broken Folsom projectile point (Figure 11a) was found in the Cody-Alberta level. Part of the refitted first flute was recovered in the Folsom level below, leaving no doubt of its derivation. The second flute was only moderately successful and it appears that a second attempt on the second

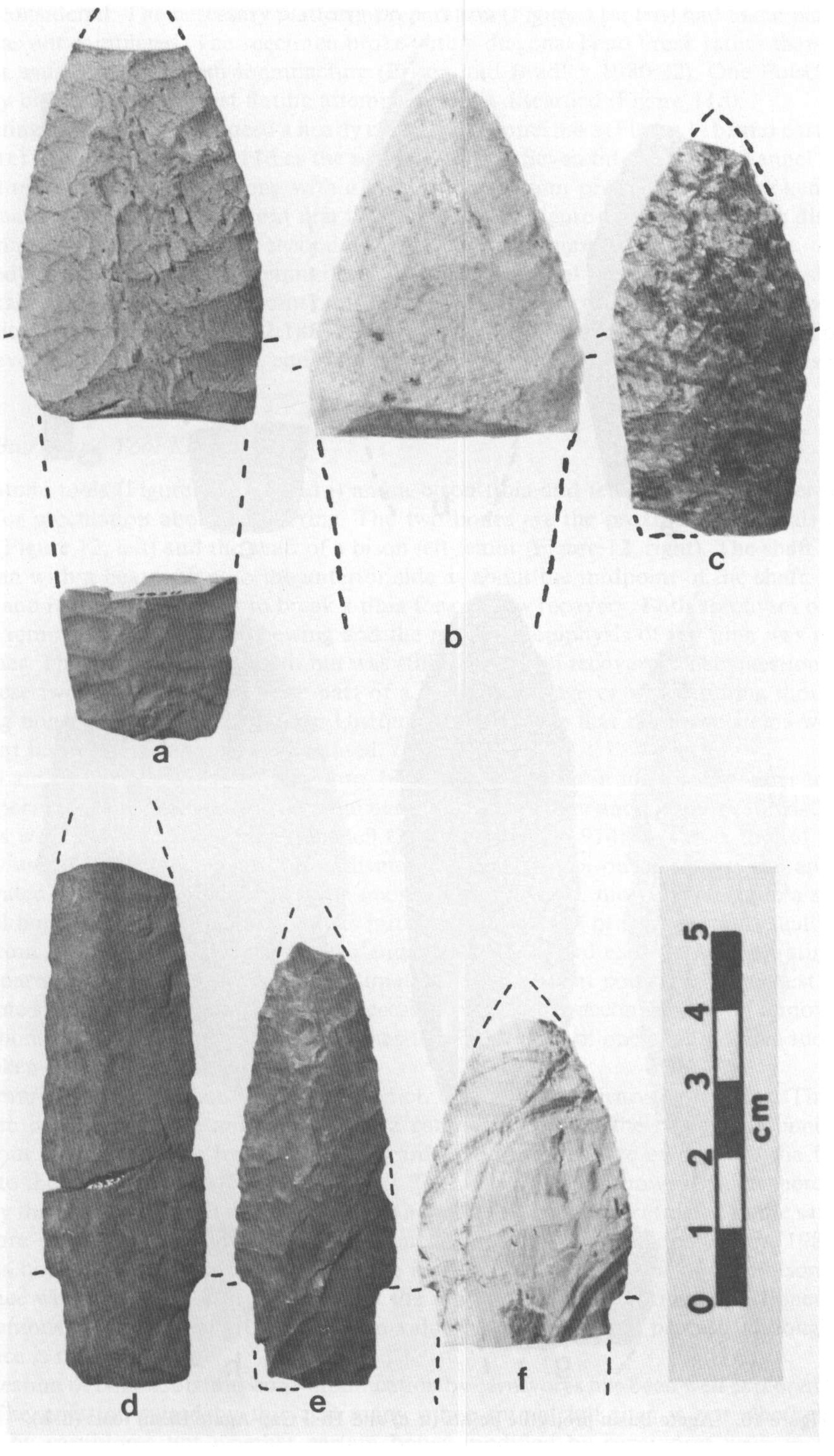

Figure 9. Hell Gap (a–c) and Alberta (d–f) projectile points.

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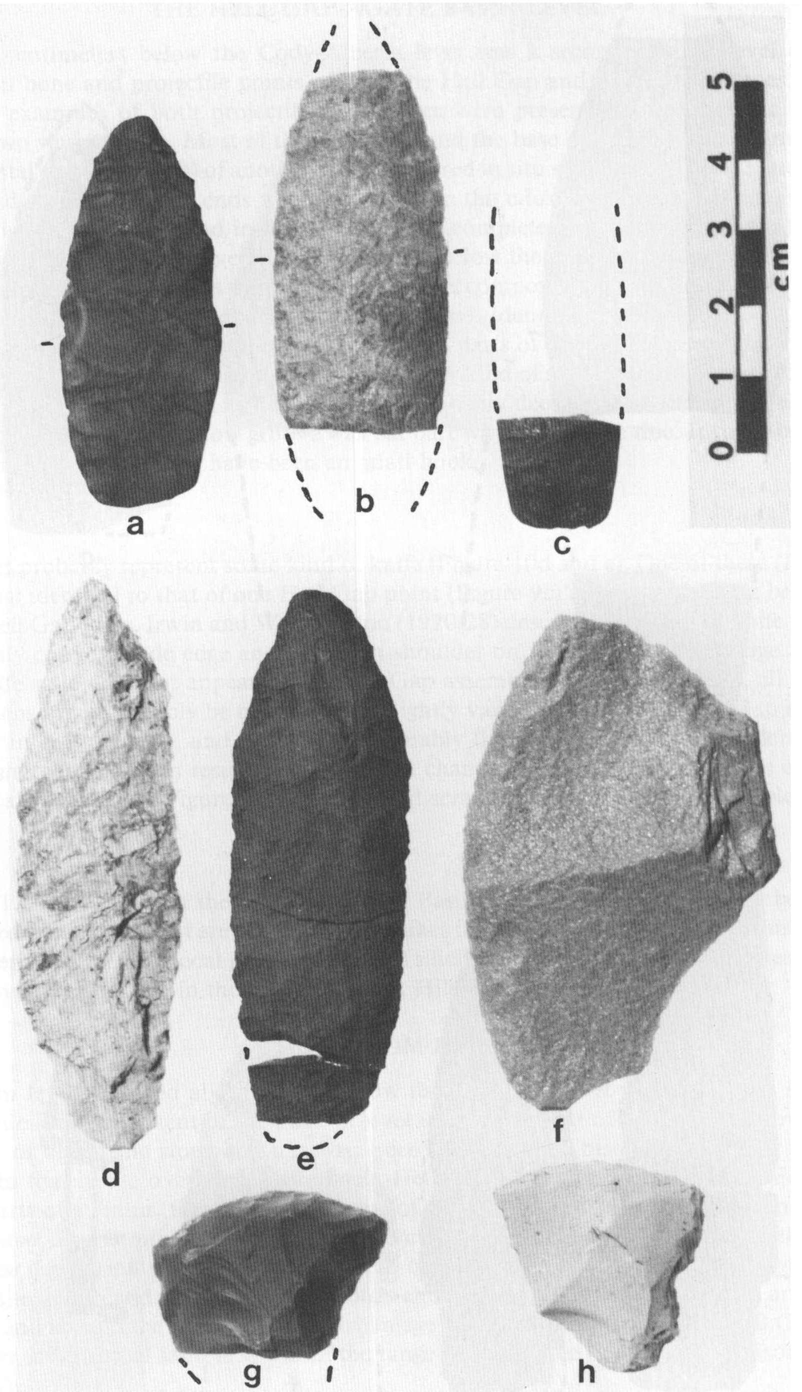

Figure 10. Agate Basin projectile points (a–c) and Hell Gap-Agate Basin tools (d–h).

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flute was considered. The necessary platform preparation (Figure 11a, left) had taken place, but the process was not completed. The specimen broke with a diagonal bend break rather than a perverse break that usually results from manufacture (Frison and Bradley 1980:22). One Folsom preform apparently broke during the last fluting attempt and was discarded (Figure 11d).

Conjoining of fragments produced a nearly complete channel flake (Figure 11b) and part of another (Figure 11e) that refits to Figure 11d as the second channel. Seven other broken channel flakes were recovered in the Folsom level along with a corner of a Folsom projectile point broken off during fluting. Channel flakes resulting from first fluting attempts (Figure 11b and c) can be distinguished from channel flutes resulting from second fluting attempts (Figure 11e and f).

This body of evidence should unequivocally establish fluting of projectile points as a site activity. The breakage of Folsom projectile point preforms at various stages of manufacture has been described in other site contexts (Bradley 1982:186–194; Frison and Bradley 1980:43–57, 1981). Tools in the Folsom level include side scrapers, end scrapers, gravers (see Table 1) and several flakes with a use retouch.

Possible Butchering Tool Kit

Three stone tools (Figure 11g, h, and i) and a bison tibia and femur found together offer some grounds for speculation about butchering. The two bones are the proximal two-thirds of a bison left tibia (Figure 12, left) and the shaft of a bison left femur (Figure 12, right). The shaft of the tibia was broken with a heavy blow to the anterior side at about the midpoint of the shaft. This was a common and relatively easy way to break a tibia for marrow recovery. Both epiphyses of the femur had been removed by carnivore chewing and the proximal epiphysis of the tibia was removed in like manner. The femur shaft was split but was still intact when recovered. The question is whether or not these two modified bones were part of a tool assemblage or were nothing more than two bison long bones chewed by carnivores. Unequivocal evidence that these two items were tools is not present but some discussion is warranted.

In the Late Prehistoric Vore buffalo jump, bison tibiae broken in identical manner to the CKM Folsom specimen were used in the bison butchering process (Reher and Frison 1980:24–25). Similar tibia tools were recovered in the Casper Hell Gap site (Frison 1974:43–45). A tool of this type is extremely useful for various tasks during dismemberment of a bison carcass. It can and has been demonstrated that breaking a tibia in this manner will produce, most of the time, a surprisingly functional bone chopper tool. Spiral breaks initiated at the point of impact tend usually to extend distally from both sides of the impact area and then turn toward each other, separating the tibia into two parts. This usually leaves the proximal end with a blunt point at the thickest part of the bone. Some shaping of the point is usually necessary and can be accomplished by removal of a few flakes of bone. The CKM Folsom specimen has the appearance of one of these tibia tools with the point broken off during use.

The femur shaft was, without doubt, shaped on both ends by carnivore chewing. The scalloped edges were produced by the animal hooking a canine tooth over the rim of the bone shaft and levering out chunks of bone by pulling backwards. Tooth marks are evident on the femur shaft adjacent to the scalloped edge (Figure 12, right). The writer believes, however, that there is a strong possibility that the femur shaft was later used as a scraping tool. Humeri treated in the same manner at the Vore site are also believed to have been used as tools (Reher and Frison 1980:26). The cancellous bone had also been removed on the inside of the femur shaft of the Folsom specimen at the place where the scalloped edge formed the most functional working edge. Bones so shaped can be demonstrated to be of great utilitarian value in the butchering process, although this kind of evidence is only suggestive.

The question of bone tools and bone modification by carnivores has been well explored by Binford (1981). The question raised by this and many other animal kill sites is not whether bone was modified by carnivores but whether certain bones modified by carnivores were in some cases subsequently used as tools. Butchering in large communal kills seems to have resulted in extensive use of what Binford (1979) has referred to as expedient tools. Large flake tools, stone choppers, and

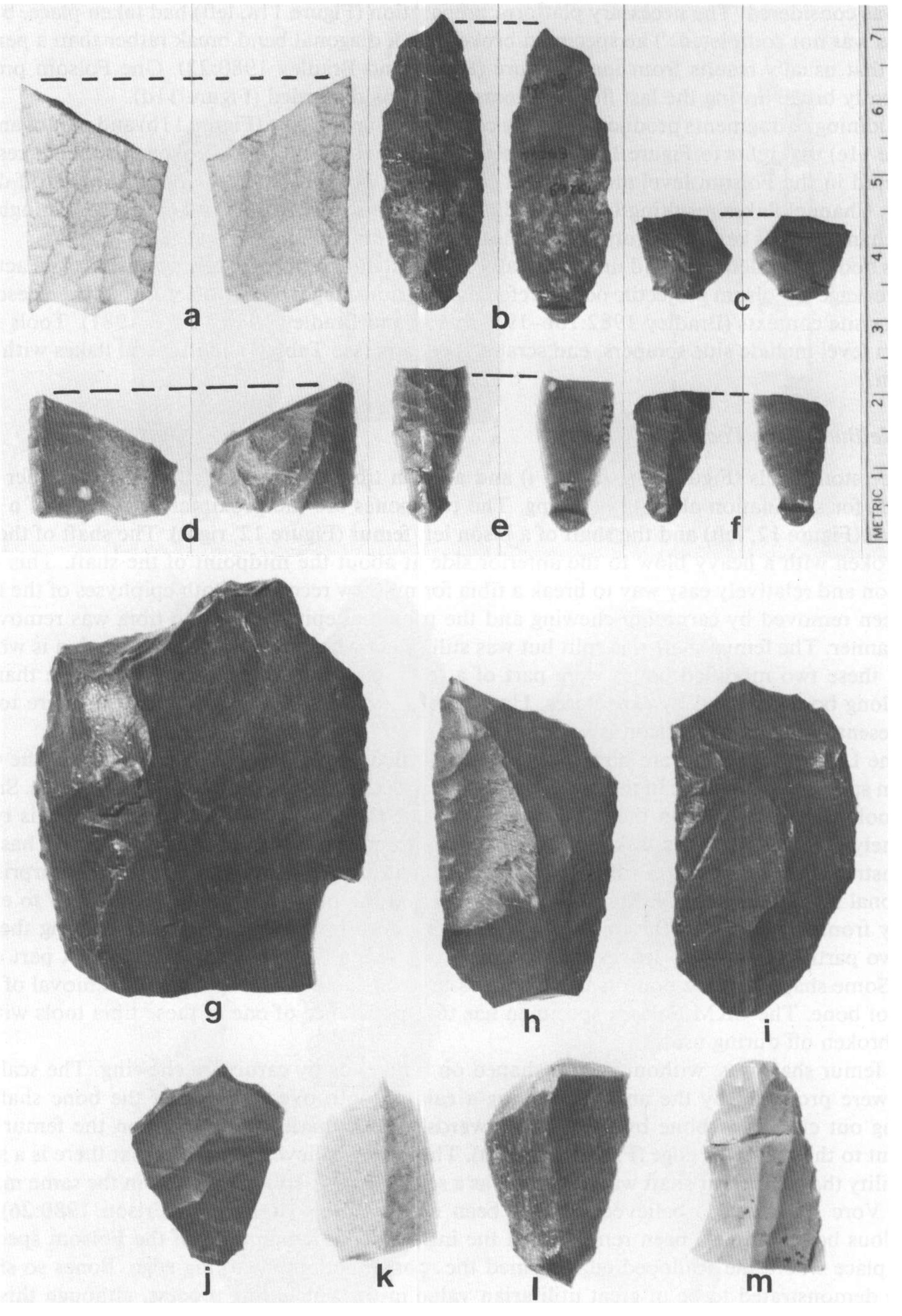

Figure 11. Folsom projectile point (a), broken preform (d), channel flakes (b, c, e, f), and tools (g–m).

hammerstones, which fall into the category of expedient tools, were used extensively in many butchering contexts. The concept of expediency has been applied to bone tools by other authors (cf. Johnson 1980; Johnson and Halliday 1980). The tibia choppers and other bison bones modified into expedient tools, including a horn core, metatarsals, and a pelvis, were used as general purpose butchering tools at the Vore site (Reher and Frison 1980:24). They were not highly curated in the sense that Binford (1976, 1979) has applied the curation concept. They were functional tools but easily acquired and/or prepared and could be used briefly and discarded without great loss. However, evidence of their use in contexts of poor bone preservation such as the Folsom component at the CKM site can never be totally convincing unless there is some unequivocal evidence of human manufacture present.

The three stone tools and the two possible bone tools comprise a functional butchering kit for large animals. Context can be important also, and the occurrence of the five items contiguously and away from other artifacts in the Folsom level seems more than mere coincidence. Careful and continued study of prehistoric animal butchering and the general nature of tool use may eventually resolve the problem.

Flakes

A total of 1,288 flakes were recovered in the Folsom level. Most are small pressure flakes from advanced stages of projectile point manufacture. Flaking materials are partly local and partly from sources known to be about 100 km to the west in the Big Horn Mountains. It is tempting from this to speculate that the Folsom group was exploiting an area to the west in the direction of the Rocky Mountains rather than east toward the Black Hills.

THE CLOVIS COMPONENT

The Clovis level is about 10 cm below the Folsom level and is restricted to a narrow strip remaining along the edge of the stratified deposits (Figure 5). One fluted point (Figure 13b) was found in two pieces, both in situ. Another fluted point had eroded out of the level and part of the base was missing due to fire-fracturing (Figure 13a) (see Table 1). Edge grinding is present on both specimens. A distal end of another point was found in situ but it was broken distally to any flute or edge grinding that may have been present. A thin (4.3 mm) chalcedony percussion flake with missing striking platform demonstrates a light use retouch on three edges (edge angles 24°, 20°, and 18°) and was probably a cutting tool.

A right camel metatarsus (*Camelops* sp.) with a depressed fracture from a heavy blow that produced several spiral breaks was recovered in the Clovis level along with a right entocuneiform and two right proximal sesamoids. This and camel remains from the Casper site (Frison 1974) are the basis for speculation about prehistoric camel procurement (see Frison et al. 1978). Four other unidentified long bone fragments are comparable in size to deer or pronghorn. Bedrock (Eocene sandstone) occurs at about 20 cm below the Clovis level.

During Clovis and Folsom times, a distinctive gley soil was formed at the CKM site (Reider 1980). Similar soils were formed also at the Agate Basin site in Clovis times (Reider 1982a) and at the Sheaman Clovis site at the Agate Basin site locality (Reider 1982b). The potential value of these diagnostic soils for identification of other Clovis and Folsom age deposits in the Powder River Basin is high but more research is needed.

THE CKM SITE AND PALEOINDIAN STUDIES

For Paleoindian studies in general, the CKM site provides us with a single record of sequential use of the Powder River Basin over a period of at least 2,000 years. The site reflects an economic orientation toward communal procurement of large ungulates—almost exclusively bison but occasionally other animals (Frison et al. 1978)—by the probable use of a common topographic feature, the arroyo trap. The data from other sites, particularly the Agate Basin site (Frison and Stanford 1982) and the Hawken site (Frison et al. 1976) provide strong support for this hypothesis. Further ideas and support for the use of the arroyo bison trap comes from later time periods (see for example Frison [1968, 1978a:201–208]) even though there were observable biological changes in the bison through time (Wilson 1978) which may have resulted in significant behavioral changes as well.

The slowly accumulating body of data on the varied aspects of prehistoric human procurement and use of bison provides a continually improving data base and increases confidence in interpre-

Figure 12. Possible bone tools from the Folsom level: Tibia tool (left) and femur tool (right).

tation of Paleoindian settlement systems and subsistence strategies. From the general context of Paleoindian studies, we are also aware that alternative methods of communal bison procurement were used, as can be demonstrated at the Casper site (Frison 1974), the Horner site (Frison 1978a: 181–182; Jepsen 1953) and the Olsen-Chubbuck site (Wheat 1972). The North American Paleoindian hunter was innovative and resourceful in his economic efforts. He was selective in the animals he took and was able to live quite well. He was not the poor nomad continually facing starvation but instead, was able to develop and continue a lifestyle that was successful and changed little for nearly two millennia.

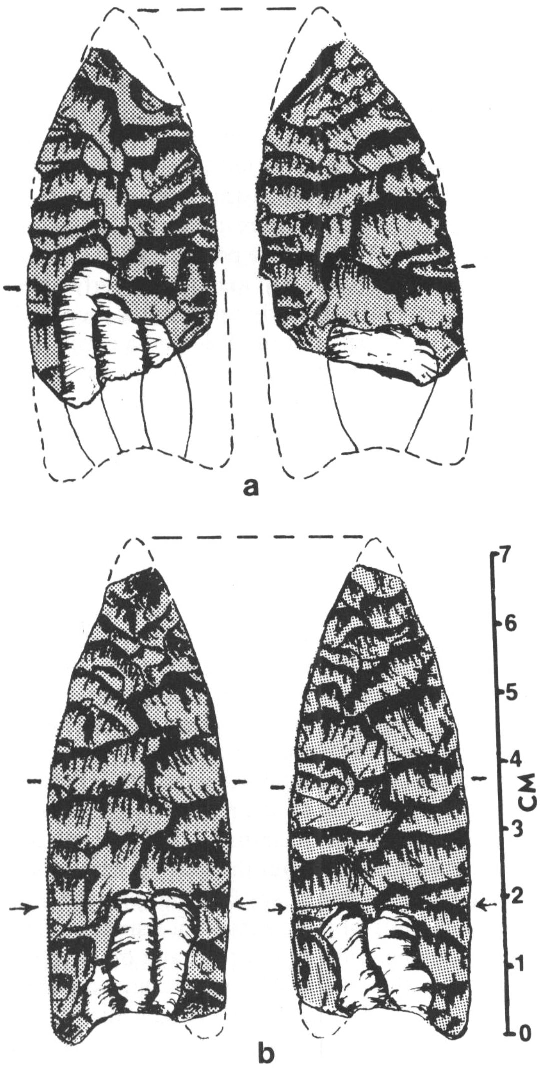

Figure 13. Clovis projectile points.

That the record of Paleoindian use of the Powder River Basin has been greatly depleted through past geologic processes is readily demonstrated by the CKM site and also by other local and regional Paleoindian sites. For example, at the Colby mammoth kill site (Frison 1976a, 1978a:91–110), the mammoth remains are in the bottom of an old arroyo that filled with sediments after the kill and preserved the mammoth bones. Later erosion changed the entire character of the site area and removed all but the deposits in the bottom of the old arroyo. Other possible evidence of cultural activity associated with the use of the site area by the Clovis group was removed.

The Agate Basin site is another example of a near loss of cultural data through geologic activity. There, Folsom, Agate Basin, and Hell Gap hunters took bison by using the topographic advantages of a wide, steep-sided arroyo. Subsequent geologic activity removed all of the ground surface present during these bison procurement events except for that in the bottom of the arroyo (Albanese 1982; Frison and Stanford 1982:27–37).

At the Casper site (Frison 1974), Hell Gap hunters trapped about 100 bison in an old parabolic

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sand dune. Subsequent sand movements removed all except the trough of the old dune feature that contained the bison bones. In all three cases, which are typical, the archaeologist is forced to interpret the original land surface from very small samples of the original. The CKM site further emphasizes the necessity of this kind of methodology.

The Sister's Hill site is the only other Paleoindian site presently known in the Powder River Basin. It was discovered over two decades ago and is of Hell Gap age (Agogino and Galloway 1965). The geology of the site (Haynes and Grey 1965) demonstrates the complexity of past climatic events as those are revealed in the stratigraphy. A few more meters of lateral stream cutting would have destroyed any evidence of the Sister's Hill site. The point here is that most sites of Paleoindian age are missing because of past geologic activities that are as yet poorly understood.

The CKM site study emphasizes another poorly understood aspect of High Plains Paleoindian studies. This is an apparent separation between the Paleoindian groups in the foothills and higher elevations of the central Rocky Mountains and most of those in the open plains, minor uplifts and intermontane basins (Frison 1973, 1976b; Frison and Grey 1980; Husted 1969). Diagnostic projectile points of the familiar cultural complexes (Clovis, Folsom, Agate Basin, Hell Gap, Alberta, and Cody) occasionally occur in the higher elevations, but rarely in the kinds of site contexts necessary for meaningful study. Only two Cody Complex assemblages have been found to date in a satisfactory foothill context. One is from the Medicine Lodge Creek site in the eastern Big Horn Basin (Frison 1976b:166–168) and the other is the Laddie Creek site (Frison 1978:41–44, 198; Larson and Frison n.d.) which is on the western slopes of the Big Horn Mountains.

Folsom material regularly appears at the higher elevations and, with the added diagnostic value of Folsom projectile point manufacture wastage, their past presence from open plains to timberline seems to be the result of human occupation rather than the movement of diagnostic artifact material by later human groups. However, there is abundant evidence believed to be older than Folsom in the high elevations that is, as yet, poorly known and understood. The future therefore should see increased interest in high altitude Paleoindian studies.

If our present data are correct, the communal bison hunt on the High Plains in Paleoindian times was, in many known cases at least, a seasonal affair for the cold weather months. Further, it is unlikely that the communal hunt was the only means of bison procurement. Individual and small group hunting must have been utilized throughout the year. Grazing animals utilize their territory in a predictable manner and the hunting group was familiar with these land-animal relationships. This familiarity was in reality the basis of their subsistence strategy. There are times of the year when bison are amenable to communal hunting practices and other times when they are not. Late fall and winter were favorable times; they were cold weather, but not bad weather, operations. Bison can be driven and otherwise manipulated as easily on a good winter day as at any time of the year. It is argued also (see Frison [1982]) that the frozen meat cache was utilized to store the surplus acquired during these late fall and winter procurement operations. However, a frozen meat cache would have tied the human group to a single location more than the same amount of dried and more portable meat would have done.

The communal bison hunt had to be well planned and, once initiated, it had to be carried through all of its sequential stages to completion. Chances of failure of any given procurement event were relatively high and, on the basis of ethnographic evidence (see, for example, Fletcher and LaFlesche [1906:281], Gilmore [1924:209], Mandelbaum [1940:190–191]), we expect that supernatural help was invoked by the proper religious specialists to increase the chances of success. The hunt was male activity, but the butchering and processing probably involved most of the group. No evidence of shamanistic activity was found at the CKM site, but it has been found in a Late Plains Archaic site (Frison 1971:85, 86) and there seems to be no reason why similar activity cannot be generalized to the Paleoindian period.

In a more specific sense, the CKM site is undoubtedly a remnant of a much larger manifestation that was very nearly destroyed by geologic processes. The site location on a north slope at the head of an arroyo is not the usual campsite location, nor do the four site component assemblages suggest campsites. On the other hand, something attracted a sequence of almost the full range of the known Paleoindian groups on the High Plains to the site over a period of at least 2,000 years. The only satisfactory answer at this time is successful animal procurement. A combination of favorable animal habitat along with topography conducive to trapping them provides an explanation for continued human use of the location. The associated campsite or sites have not been located and were most likely on higher ground where they have been destroyed by erosion.

The age profile of the bison in the Cody-Alberta bone bed allows several possibilities: (1) a large number of animals was killed at one time, (2) several small groups of animals were killed over a short period of time, or (3) both situations occurred more than once. Whichever situation is accepted, communal animal procurement is the most satisfactory general interpretation. The bone in both Hell Gap-Agate Basin and Folsom levels is nearly all bison bone broken into small pieces and this, along with the tool assemblages, suggests the fringes of areas of bison butchering and/or processing activities. Little can be said of the cultural activities reflected in the Clovis level.

The projectile point fluting activity in the CKM Folsom level is not unexpected considering the evidence from the Folsom level at the Agate Basin site. Here the same activity took place around a small Folsom bone bed that was probably an actual kill location (Frison and Stanford 1982:39–43). There is a strong suggestion in both cases of ritualistic connections between killing large animals and fluting Folsom projectile points. Red ocher was present in both Clovis and Folsom levels and this same phenomenon was seen in levels of the same two cultural complexes at the Agate Basin site (Frison and Stanford 1982:38, 144) and in Folsom levels at the Hanson site (Frison and Bradley 1980:9).

The number of persons involved in the CKM site and other similar communal procurement operations is conjectural but the total could have reached 75 to 100 persons. This would have allowed a possible 15 to 20 grown males, a reasonable number to carry out a communal hunt from start to finish. A reasonable size for the territory exploited by a band of this size can only be estimated on the basis of present conditions. The standard formula for the year-round animal carrying capacity of Powder River Basin rangeland is one cow and calf for 12 ha or 8/km^2. Animal food conditions were probably as good or better than at present during most of the Paleoindian period, if our paleoclimatic data are correct (Reider 1980, 1982a, 1982b; Walker 1982). If so, a 1,300 km^2 area could have supported 10,000 buffalo with at least 3,000 females of breeding age. With an exclusive diet of buffalo meat, the cultural group of 100 could have lived easily on one mature animal a day which would have been a light predation factor on a herd of 10,000 animals. The Powder River Basin easily could have supported over 25 such bands, allowing 1,300 km^2 per band, even considering that other predators were present and also living off the buffalo to some extent. If this speculative model even begins to approach the Paleoindian situation, it is immediately apparent that the present data base for study of the Paleoindian in the Powder River Basin is very small, considering that at present only two Paleoindian sites have been found there.

THE CKM SITE AND CULTURAL RESOURCE MANAGEMENT

There is no denial that CRM is needed in order to adjudicate the use of archaeological resources and ensure that the maximum amount of information will be extracted as these resources are used. Toward these ends, it is time to look at CRM critically and put it in the context of a scientific experiment. The results of this experiment should be critically analyzed to determine whether the best interests of the resource (archaeological sites) are being served. If not, as with any scientific experiment, CRM policy should be modified as needed.

The investigation of the Carter/Kerr-McGee site is by no means touted as a model for the conduct of Paleoindian research. It is presented instead in defense of principles that should prevail in determining the management, and consequently the final disposition, of archaeological resources. Further discussion requires exploration of the nature and rate of occurrence of archaeological resources, and of how they are affected by forces outside their natural context, and how they are exploited.

The Nature of Archaeological Resources

In contrast to other natural resources such as the coal, oil, gas, uranium, wildlife and vegetation, archaeological resources in the Powder River Basin are, almost without exception, noneconomic in nature. They are finite and nonrenewable. They are irreplacable once they have been disturbed or removed. The proper use or exploitation of such resources lies in the extraction of data. It follows that proper management of archaeological resources should reflect the interests of data recovery.

Some sites in the Powder River Basin are important enough to save for future research. Some of these can be protected and preserved and should be excluded from earth disturbance except as research needs dictate. Other sites can be appropriately studied through proper excavation prior to mining operations. The vast majority can be conserved by surface collecting and proper data recording. Priorities must be set in evaluating archaeological resources and in making management decisions.

The Development of the CRM Program for the Powder River Basin

In 1970 there were less than half a dozen archaeological sites in the Powder River Basin that had been subjected to more than superficial investigation. About the same number were known from peripheral areas. When it became evident that energy resource extraction would proceed with unprecedented rapidity, a crash program to deal with cultural resources was initiated. An inventory of cultural resources was needed in order to determine what manageable resources were present and what kinds of management were needed. Avoidance became the other management strategy since research designs for mitigation required the inventory that was yet to be made.

Unfortunately, research was discouraged in subsequent developments in CRM, and the responsibilities of industry ended with inventory, avoidance and limited impact mitigation efforts. There were inadequate provisions for consolidation and analysis of the data gathered under CRM supervision, and no provisions were made for definition and further study of the problems generated at these levels.

Patterns of Land Ownership and Cultural Research Management

Land in the Powder River Basin is owned and its resources are managed by many agencies. Some is privately owned; some is private with federally-owned subsurface; some is owned by the Department of the Interior (Bureau of Land Management [BLM]), some by the U.S. Department of Agriculture (U.S. Forest Service), and some by the State of Wyoming. BLM was the lead agency for cultural resource management, beginning in the early 1970s. In the late 1970s the Office of Surface Mining (OSM, Department of the Interior) began to assume responsibility for CRM of strip mining areas. In fact, for some time there was disagreement between BLM and OSM over jurisdiction. To date there has been no well defined CRM policy established for either the State of Wyoming or private lands. However, both BLM and OSM have successfully extended their jurisdictions to private and state lands destined for strip mining.

The CRM Power Structure and its Enforcement

A categorical breakdown of present-day archaeologists results in three primary groups and a relatively small fourth. This includes: (1) cultural resource managers, (2) private and institutional contractors, (3) academic archaeologists, and (4) avocational archaeologists.

The CRM archaeologists derive their power from federal and state law. The contractors have little if any power in CRM but must follow the guidelines as those are interpreted by federal and state regulators. The academic archaeologist has some power through peer pressure, but is in much the same position as the contractor in terms of constraint by rules and regulations. The CRM archaeologists are paid by federal and state agencies. Contractors are paid by industry through a contracting system, and the academics are paid by their institutions. The avocational archaeologist receives no pay but contributes time and effort.

It is immediately apparent that, under the present system, CRM programs have the power to control the destiny of archaeological resources, particularly in areas where large percentages of land are under federal ownership and control. This is a responsibility that must not be taken lightly. Cultural resource managers should always remember that the proper use or exploitation of archaeological resources is to see that they are researched in such a manner as to produce the maximum amount of information.

CONCLUSIONS

Considering the extent of intensive surface survey conducted to date in the Powder River Basin, the archaeological researcher committed to this area is obliged to explain the failure of survey archaeology to reveal the expected cultural resources. Few areas of comparable size in the United States have witnessed the dollar amount spent per acre on cultural resource management in the last decade as has the Powder River Basin. Industry has underwritten the effort, mostly through private contracting firms; a small amount has been provided through state agencies. After a decade of expensive experimentation in cultural resource management, it is time to review the results and to plan the future of culture resource management for the Powder River Basin.

First and foremost, the concept of "inventory and avoidance" of cultural resources without a strong parallel program of research should be abandoned. The present policy is seriously hampering the study of archaeology as an academic discipline in areas where half or more of the land is federally owned and controlled. Cultural resource management that fails to recognize the need for continuing research is as sterile as teaching without research.

One can argue for or against the concept of avoidance, depending upon the situation. On the High Plains, having little vegetative cover and high rates of erosion, exposure of cultural resources usually threatens them with natural destruction. Too often, avoidance means that the road, pipeline, transmission line, or oil well pad is moved to an alternate location which destroys other cultural resources that were not yet exposed by natural processes.

All agencies, state and federal, need to develop a consistent management program. Direct contradictions in management decisions have led to too many unnecessary delays for industry, loss of cultural resources, and above all, erosion of the credibility of the archaeological profession. The cultural resource manager, the research archaeologist and the contract archaeologist must develop and agree upon a program that operates in the best interests of the resources. The CKM site should serve to alert all elements of the archaeological profession to the fragile nature of Powder River Basin cultural resources and the need for a cultural resource management policy that will ensure their optimal interpretation.

Although the CKM site is only a remnant of a much larger site, it is of major importance to High Plains Paleoindian studies. The results of its investigation have further strengthened the Paleoindian cultural chronology, have supported ideas concerning a human subsistence strategy based on *Bison* procurement, and have increased our knowledge of early Holocene paleoecology. However, unless archaeologists are well trained in a number of disciplines or can avail themselves of the necessary expertise of individuals in other disciplines, faulty interpretations are inevitable. The archaeologist must know if the remnant site areas are arroyo bottoms, stream terraces, or troughs of sand dunes in order to reconstruct the general character of the site area at the time it was being used. Since these High Plains sites usually involve economic strategies strongly oriented toward large ungulate procurement, all possible interpretive methodologies for reconstructing paleolandforms and the prevailing ecological conditions must be exploited to the maximum possible degree. A strong program of interdisciplinary research is now needed to achieve new levels of explanation.

Cultural resource managers should therefore be either well trained in research or expected to seek the expertise and guidance of those who are so trained. Since it is not possible to either save or investigate all archaeological resources, cultural resource managers must, in addition, be able to establish priorities and make proper decisions. Poor management not only diminishes our data base, but it also continually deteriorates the public image of archaeology and archaeologists.

We were told more than four decades ago that science is "preeminently a way of dealing with experience" and that "one *sciences,* i.e., deals with experience according to certain assumptions and with certain techniques" (White 1938). More recently, we were most appropriately reminded of these same concepts (Gonzalez 1983). It is time now for the entire archaeological profession to analyze itself critically and to reconfirm that archaeology is a science, an academic discipline and an integral part of the broader discipline of anthropology. Archaeology has progressed in the directions indicated more than two decades ago (Binford 1962) but it has also split into factions, some of which contend that archaeology is as much a public service as a science. This is a distorted view and should be corrected to remind everyone that the public service aspects of archaeology were conceived and developed to protect the resource and ensure its proper use.

The data base is now sufficient to plan long-range, problem-oriented Paleoindian research in the Powder River Basin. The goals of this research should be agreed upon by researchers, CRM, contract archaeology and avocational archaeologists, and all should work together toward these goals. By doing so, we ensure that the resources that all archaeologists claim as their area of concern will be properly managed and exploited.

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