Archaeology and cultural resource management: A case study from the Ashland Division, Custer National Forest, Montana

Gary A. McLean

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ARCHAEOLOGY AND CULTURAL RESOURCE MANAGEMENT:
A CASE STUDY FROM THE ASHLAND DIVISION, CUSTER
NATIONAL FOREST, MONTANA

By
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B.A., University of Montana, 1974

Presented in partial fulfillment of the requirements for
the degree of

Master of Arts
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Approved by:

Chairman, Board of Examiners

Dean, Graduate School

Date
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ABSTRACT

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Archaeology and Cultural Resource Management: A Case Study from the Ashland Division, Custer National Forest, Montana

Director: Dee C. Taylor

Archaeologists have suggested different settlement and subsistence patterns of the prehistoric human occupants in Southeastern Montana. Prehistoric human behavior is, at least partially, reflected in the archaeological record. The purpose of this research is to analyze some of the data collected from the area to evaluate the different settlement and subsistence patterns that have been suggested.

Using the chipped-stone artifact assemblage collected in a 1974 archaeological inventory, five hypotheses relating to prehistoric settlement/subsistence patterns are examined. In analyzing the functional attributes of the artifact assemblage observed, certain activity areas are identified that relate to prehistoric human settlement and subsistence patterns.

This research identifies prehistoric human activities based on the artifact assemblage, not on the more subjective notion of site type. It also illustrates the need for an approach to cultural resource management that is compatible with anthropological theory. In the final analysis, a localized transhumance settlement and subsistence pattern is not indicated. Likewise, a shift in settlement patterns over time is rejected.
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CHAPTER I

INTRODUCTION

Federal agencies are currently generating a great deal of archaeological research. In response to direction set forth in Federal regulations, they have conducted or sponsored archaeological investigations of varying scope and intensity.

Prior to the 1970's, archaeological investigations in Montana were primarily the result of private or academically sponsored research projects. Artifact assemblages in the possession of enthusiastic amateur collectors helped bolster the archaeological record. Subsequent to enactment of Federal legislation in the 1960's and 1970's, which was aimed at preservation of the nation's prehistoric and historic resources, a new impetus for archaeological research appeared.

Preservation laws mandate that Federal land-managing agencies address "cultural" resources in their decisions regarding management practices. Under the rubric of "Cultural Resource Management" (CRM), these agencies began programs for the inventory, evaluation and, in some cases impact mitigation of cultural resources in response to the stewardship entrusted in them. Federal agencies possessed
neither the personnel nor the facilities to conduct CRM investigations so they often turned to local universities or consulting firms for assistance. Contract archaeology became the vanguard of this new impetus.

Agencies with experience in managing other resources set out to "manage" cultural resources under their jurisdiction. These early-day efforts focused on managerial concerns: rarely did they make contributions to theoretical research. As Schiffer (1977:9) points out:

It is hardly necessary to document in any detail the dismal research record of contract archaeology. A glance at the bibliography of any compendium of method and theory ... will attest to the negligible impact of contract 'research' on modern archaeological thought.

This situation developed for a number of obvious reasons: Congress passed historic preservation laws, but failed to allocate funds to implement them; land-managing agencies lacked expertise in this area; in the interest of conservation archaeology, Federal regulations (e.g. 36 Code of Federal Regulations) encouraged avoidance of cultural properties by making "no effect" alternatives the easiest to deal with; the arbitrary boundaries of Federal lands hampered holistic approaches; investigators were under contract to provide management information at a minimal cost, not necessarily information applicable to problem-oriented research; and there was little display of CRM results in widely read archaeological works.
My purpose here is not a critique of CRM practices. Using an example with which I am intimately familiar, I hope to demonstrate that archaeology, done under programs of cultural resource management, can provide positive contributions to theoretical archaeology. In the initial CRM inventory process there is a qualitative difference between information collected for Federal management needs and information collected for archaeological research. I hope to bridge that "quality" gap by using management orientated data to pursue legitimate anthropological research. This paper is an endorsement of the statement that "there is no question that data gathered without problem orientation can be useful in explanatory research" (King, 1975:90).

I will reexamine archaeological data that I recovered for the Forest Service intended to help managerial decisions, in an effort to address some hypotheses concerning prehistoric cultural settlements and subsistence patterns within the pine parkland environment in southeastern Montana. In the process, it will become evident that my research design and methodology limit the application of the data to hypothetical-deductive analysis. Notwithstanding, I believe that my "robust" treatment is appropriate considering the scope of the initial study (McLean, 1975). Furthermore, the results may provide for a clearer understanding of some of the prehistoric cultural tendencies in this setting on the northern Plains. Those shortcomings which become evident will serve
to illustrate the importance of designing CRM inventories in a fashion that is compatible with anthropological concerns, whether for immediate use or future analysis. My 1974 study reflects what I thought to be the "state of the art" of CRM studies in Montana during the mid 1970s. Similar shortcomings can be found in comparable studies elsewhere.

The data base I will use for analytical purposes is derived from the prehistoric chipped-stone artifact assemblage collected during a cultural resource inventory I made in 1974 (McLean 1975). I realize that archaeological samples collected from the surface of sites are subject to a variety of conditions that may have an effect on the outcome of statistical manipulations (e.g. previous collection of artifacts by amateurs and/or professionals, success of my observations, erosion, etc.). Therefore, I employ simple "non-parametric" statistical procedures to suggest some general prehistoric human behavioral traits relating to human settlement and subsistence patterns in the localized environment of the Ashland Division, Custer National Forest. I do not consider this thesis a peremptory statement, but rather a gesture of initial anthropological inquiry. Impending archaeological and CRM investigations may contradict some inferences I have presented.

Predominant use of the term "archaeological" in place of "CRM" reflects prevailing usage of the term at that time.

Before going further, it is only appropriate I recognize the improvement within the entire spectrum of CRM over time.
All agencies stand on firmer ground with respect to archaeological theory than they did a decade ago. This trend should continue.
CHAPTER II
FEDERAL LEGISLATIVE BACKGROUND

The first major piece of Federal legislation aimed at protecting "antiquities" was the Antiquities Act of 1906 (P.L. 59-209). In enacting this law, Congress made it illegal to damage or appropriate antiquities located on lands under Federal jurisdiction. The Act also established a permit system whereby professional scientific research could be conducted. Most important, it set the scene for future preservation and established penalties for violations of the Act.

Two decades later, the Historic Sites Act of 1935 (P.L. 74-292) directed the Secretary of the Interior to provide leadership in protection of the Nation's cultural resources. It also authorized the Secretary of Interior to locate, evaluate, and recognize significant archaeological and historical sites. A great deal of "salvage" archaeology was conducted in response to this Act under the heading of "River Basin" archaeology.

The Reservoir Salvage Act of 1960 (P.L. 86-523) was the first major legislation to authorize the expenditure of funds for preservation of cultural resources. Although the Act authorized expenditures of up to one percent of the project cost for preservation measures, expenditures of this magnitude never materialized.
In 1966, Congress passed the Historic Sites Preservation Act (P.L. 89-665), and the 1966 Department of Transportation Act (P.L. 89-670). The Historic Sites Preservation Act expanded the 1935 Historic Sites Act directing the Secretary of the Interior to maintain a National Register of Historic Places. It also created the President's Advisory Council on Historic Preservation. The Council was given the responsibility of ensuring compliance with Section 106 of the Act through a commentary and review process whenever properties eligible for listing in the National Register were threatened by Federal activities. The Department of Transportation Act required that cultural resources be considered during the planning process in order to minimize impacts to the resource.

The National Environmental Act of 1969 (N.E.P.A. P.L. 91-190) requires all Federal Agencies to consider the entire realm of environmental resources, including archaeology, during the planning process. The N.E.P.A. requires that environmental impact statements be prepared prior to implementing Federal undertakings which affect the environment. Now all Federal agencies are required to provide information on the nature, extent and significance of cultural resources prior to impact.

Executive Order 11593 of 1971 was a mandate to Federal agencies to inventory, record, and evaluate all cultural resources on properties under their jurisdiction by July, 1973. Funds were never appropriated to implement the Order and, 10 years after the 1973 deadline, this process is still in its infancy.
In 1974 the Archaeological and Historic Conservation Act (P.L. 93-291) amended the Reservoir Salvage Act of 1960 by authorizing the expenditure of Federal project monies (up to one percent) for preservation measures on all Federal undertakings. This put all Federal land-managing agencies in the cultural resource management business.

The most recent legislation involving protection of the Nations cultural resources is the Archaeological Resources Preservation Act (A.R.P.A.) of 1979 (P.L. 95-96) A.R.P.A. increased penalties for the destruction or removal of cultural resources located on Federal property. Violators of the Act now face felony charges and/or heavy fines where before offenses were punishable by misdemeanor statutes only.
Prehistoric human populations in North America occupied virtually every geographic setting available. Their interaction with, and adaptation to, environmental conditions is manifest in the archaeological record. Environmental parameters tend to place limits on some human activities, especially the economic pursuits of prehistoric hunting and gathering groups. I feel the prehistoric settlement/subsistence patterns of prehistoric peoples inhabiting the Ashland Division are tied to resources available in the different micro-environments present. An understanding of the study area environment exploitation of different areas of the Ashland Division must also be considered.

Archaeologists working in Montana have been hampered by an incomplete knowledge of prehistoric environmental conditions in their respective areas of study. This impediment applies to the Northwestern Plains in general and is compounded by the diverse localized environments found in Montana. The Ashland Division environment is atypical of that found on the open plains, but is comparable to other areas of Montana (e.g. Wolf Mountains).
The Ashland Division environment is characterized by pine covered buttes and ridges dissected by grass and sage covered creek bottoms. Open grassland parks are found on tops of larger buttes. Steeper slopes in the area support little or no vegetation. Numerous springs seep from exposed aquifers, usually emitting only a trickle of water.

Archaeologists have theorized about the paleoclimate of the Northwestern Plains (Caldwell and Conner 1968:13:15; Frison 1978:4-8). A central argument revolves around the effect, if any, that the Altithermal period identified by Antevs (1948) in the Great Basin had on the climate of the Northwestern Plains. Answers to questions dealing with the paleoclimate of the Northwestern Plains await further, more intensive research. But, for purposes here, I assume that the overall climatic conditions of the Ashland Division have remained relatively stable for the last ten millenia.

Location

The study area includes lands within the Ashland Division of the Custer National Forest. This is located in Powder River and Rosebud Counties, Montana. The Ashland Division lies approximately 134 kilometers east of Billings and 32 kilometers west of Broadus, adjacent to the eastern boundary of the Northern Cheyenne Indian Reservation as shown in Figure 1. The eastern boundary of the Northern Cheyenne Indian Reservation is the middle of the Tongue River. There are approximately 440,000 acres within the Ashland Division boundaries.
FIGURE 1 - Map of the Ashland Division, Custer National Forest.
Geomorphology

Topographic relief of the Ashland Division is abrupt. This pine parkland environment consists of "... broad rolling uplands, angular sandstone capped buttes and ridges, and deeply dissected badlands where shale beds have been exposed to running water" (Newby, et al 1972:83). It is part of the large, unglaciated Missouri Plateau. Erosion is active and is creating numerous small intermittent drainages which originate near the tops of scoria/sandstone ridges and buttes. Narrow, gently rolling creek bottoms separate prominent topographic features. Maximum relief is approximately 418 meters and ranges in elevation from 915 meters near the mouth of the East Fork of Otter Creek to 1333 meters at the top of Cook Mountain.

The Tongue River, flowing north to its confluence with the Yellowstone River at Miles City, is the main water course in the immediate area. Otter Creek is the single perennial stream on the Ashland Division (USDA 1978). The main course flows northward bisecting the southern portion of the Division before emptying into the Tongue River at Ashland. The East Fork of Otter Creek flows southwest, cutting diagonally through the northern portion of the Ashland Division. Numerous east-west flowing intermittent feeder streams dominate the dendritic drainage pattern of Otter Creek. As a consequence of the east-west orientation of secondary drainages, north-south exposures (slopes) dominate the landscape. Northern aspects
support stands of ponderosa pine (Brown 1971). Warm, dry southern aspects are heavily eroded supporting sagebrush vegetation communities. In a word the geomorphology is dramatic.

Climate

Generally speaking, the climate of the study area is typical of the Northern Great Plains. It is considered semi-arid: however, climatic conditions vary to the extent that both arid and humid conditions have been recorded (Thornwaite 1941, IN Brown 1971). Average annual precipitation varies dependent on elevation; on the average, higher elevations receive between 30 and 35 centimeters per year (USDA 1978). Nearly half the precipitation falls as rain during the growing season (May through September). Thunderstorms, occasionally accompanied by hail, are frequent throughout hot summer months. The annual average temperature ranges between 6°C and 8°C, dependent on elevation (Dightman 1963, IN Brown 1971). Winters are cold, but not extreme and "Chinook" conditions often occur. During winter months, winds out of the west and northwest can leave ridges and fields relatively bare of snow, creating deep drifts in the draws.

Geology

The Ashland Division, Custer National Forest lies within the Tongue River sub-unit of the Ft. Union Formation, a deposit comprised of weakly consolidated sediments (Brown 1971).
Ft. Union materials date from the Paleocene Epoch (68-58 million years ago). The Tongue River depositions are the uppermost unit of the Ft. Union Formation and they contain sizable coal deposits. Tongue River deposits consist of sandstone, shale, sandy shale, and limestone (rare) beds. Extensive "porcellanite" outcrops, formed by the combined effects of burning lignite beds and pressure above and below clay-shale deposits are ubiquitous throughout the area. Porcellanite is an acceptable raw material for the manufacture of chipped-stone artifacts and, understandably, most artifacts occurring in the area were made of it. The Tongue River unit outcrops in the highlands between drainages, the lower terrain is generally underlain by shale and soft sandstone (Thurlow 1974).

**Ecozones**

The National Environmental Policy Act of 1969 acted as a stimulus not only for archaeological fieldwork, but for other earth sciences research as well. Geologists, hydrologists, botanists, silviculturists, soil scientists and others launched on a concerted effort to study the environment in the public domain. One such effort involved the study of micro-environments within the boundaries of the Ashland Division, Custer National Forest.

Forest Service personnel in cooperation and consultation with members of local universities such as Dr. Melvin S. Morris and Ray W. Brown, Department of Forestry, University of Montana,
made an intensive study of the Ashland Division environment. Their efforts culminated in the identification and delineation of ten discrete "ecozones" distributed throughout the area. Ecozones were established based "on similarities in vegetative associations, soils, topography, microclimate, and animal communities" (USDA Forest Service 1978:1B). The "ecosystem" is a handy ordering device for analyzing distributions of natural environmental phenomena, if viewed judiciously.

Beckes (1974), McLean (1975), and to some extent, Davis (1976) refer to this ecosystem in their discussions of the spatial distribution of cultural materials. Their inferences about prehistoric human settlement/subsistence patterns are contingent on the distribution of these ecozones related to a supposed differential human use of the area. Recognizing that there may be synchronic limitations, an ecosystems approach remains an appropriate ordering device for some of the statistical variables included here. My description of those characteristics predominant in each ecozone is necessarily brief. A comprehensive view of the ecosystem is available in the Ashland Plan (USDA Forest Service 1978); illustrations depicting characteristic locations of the ecozones are shown in Figures 2 and 3. Refinement of the ecosystem over time has led to some changes in the names of certain ecozones (i.e. "Creek Terrace to Lower Slopes) as defined in 1974.
FIGURE 2 - Typical disposition of ecozones on moist slopes in the Ashland Division, Custer National Forest (After USDA 1978:11A).

FIGURE 3 - Typical disposition of ecozones on dry slopes in the Ashland Division, Custer National Forest (After USDA 1978:12A).
Creek Bottom and Lower Slopes

This ecozone is found on level to gently rolling alluvial flats. It is characterized by shrub-grass vegetative associations including silver sage, western wheatgrass, Kentucky bluegrass, and blue grama. It provides forage for whitetail deer; but the principle animals inhabiting the area are the vesper sparrow, badger, and skunk. Most of the lands classified within this ecozone are privately owned.

Open Hillsides

The topography of this ecozone is similar to the adjacent Creek Bottom and Lower Slope ecozones except that the toes of the alluvial fans are steeper. Erosion is active due to runoff from adjacent ridges and buttes. Vegetation is characterized by silver sage, western wheatgrass, green needlegrass, and big bluestem. Animals using the area are the same as those listed in the Creek Bottom and Lower Slopes ecozone.

Scoria/Sandstone Outcrop

This ecozone consists of steep or vertical sandstone and scoria outcrops. Erosion is prevalent and the vegetative cover is sporadic. Warmer southern exposures support a heavier density of plant species than do northern exposures. Vegetation is dominated by shrubs including: skunkbrush sumac, Rocky Mountain juniper, big sagebrush, intermittent patches of grasses, little bluestem, and bluebunch wheatgrass are present. Numerous species of birds
nest in the cliffs. Outcrops of porcellainite are common.

**Grassland Parks**

This ecozone is found on the upper reaches of moderate slopes and rounded hilltops. It consists of small park-like areas surrounded by trees. Precipitation is greater than that found at lower elevations and this fact, combined with a greater variation in soils and exposure, allows this ecozone to support a diverse vegetative association. Characteristic plant species include: Idaho fescue, western wheatgrass, big bluestem, silver sage, and Yarrow.

**Dry Slope Ponderosa Pine**

This ecozone consists of gentle to steep slopes and ridges. Southern exposures support a moderate-overstory of ponderosa pine. Erosion can be considerable, especially on steeper northern exposures. Understory vegetation is dominated by skunkbrush, Rocky Mountain juniper, Idaho fescue, and big and little bluestem.

**Moist Slope Ponderosa Pine**

This ecozone contains an abundance and variety of vegetation. It is usually found on moist northerly slopes, on hilly uplands or in sheltered draws. The ponderosa pine overstory reaches its greatest expression in this ecozone. Amounts of understory vary dependent on moisture. Typical understory vegetation characteristically consists of Idaho fescue, chokecherry, snowberry and spirea.
Upland Prairie Grassland

This ecozone is found on large level uplands on top of the major buttes and ridges. The vegetation is reminiscent of that typically associated with the prairies of the Northern Plains. It is dominated by grasses, forbes, and legumes including: green needlegrass, western wheatgrass, big bluestem, scurf pea, and prairiecone flower. It occurs frequently in the southern portion of the Division and rarely on the northern portion.

Upland Prairie Sagebrush

Topographically, this ecozone is similar to that of the Upland Prairie Grassland. The principle difference is in the dominance of big sage in this ecozone. Characteristic vegetation also includes: green needlegrass, western wheatgrass, silvery lupine, and sedge. Except for small inclusions located on the northern portion of the Division, this ecozone is limited to the southern half of the Division.

Upland Prairie Bunchgrass

This ecozone is located on dry, sparsely vegetated scoria ridges. The topography consists of moderate to steep side slopes and narrow ridgetops. Vegetation in the ecozone is dominated by bluebunch wheatgrass, green needle grass, skunkbrush and prairie rose. The occurrence of this ecozone is rare in the northern half of the Division, but occurs frequently in the southern half.
FIGURE 4 - Idealized profile of the landforms located in the Ashland Division, Custer National Forest (After USDA 1978:25A).
CHAPTER IV
CHRONOLOGICAL FRAMEWORK

Until recently, archaeological research in southeastern Montana and adjacent lands in Wyoming was dominated by area or site specific studies (Loendorf 1969, 1970, 1973; Husted 1969; Wedel et. al. 1968; Brown 1969). No comprehensive explanatory archaeological frameworks or chronological schemes that pertain specifically to southeastern Montana presently exist. Archaeologists have relied heavily upon the cultural framework for the Northwestern Plains proposed by Mulloy (1958), although differing frameworks have been suggested. Recently, Frison (1978) has presented a cultural chronology for the High Plains of North America that is similar to, but more refined than that of Mulloy. Because the archaeological data from the four investigations under study here use the chronology developed by Mulloy (1958), his framework has been retained in the present study.

Mulloy's chronological scheme addresses certain cultural phenomena present in southwestern Montana. Particular manifestations and, undoubtedly some data from the future, must be analyzed with reference to other established chronologies, or they must await development of an area-specific cultural sequence. Mulloy's *A Preliminary Historical Outline for the Northwestern Plains* (1958) delineates five broad prehistoric periods.
Early Prehistoric Period (ca 11,000 B.C. to ca 4,000 B.C.)

This period subsumes a large number of distinct human groups ranging from the earliest known and documented Clovis complex to the later and varied "Plano" groups. The Clovis complex was characterized by a group of hunters who subsisted at least partially on mammoths. Subsequent Paleo-Indian populations relied heavily on extinct bison species for food, clothing, shelter, and other items of hide, sinew, bone and horn. We do not know how intensively these groups exploited vegetal resources, but some projectile points from the Early Prehistoric Period include the fluted Clovis, Folsom, and points with a variety lancelate forms (e.g. Scottsbluff, Angostura, Agate Basin). These are thought to indicate a population and territorial expansion of big-game hunters.

Early Middle Prehistoric Period (ca 4,000 B.C. to ca A.D.1)

A noticeable change in projectile point morphology distinguishes the Early Middle Prehistoric Period. The Period is characterized by lanceolate, large side-notched, stemmed and corner-notched forms. Both extinct and modern forms of bison were hunted throughout this period. There is little evidence to indicate a reliance on vegetal foodstuff early in the period, but a number of grinding stones, manos, and roasting pits have been recovered or recorded from McKean sites (Mulloy 1954). The Early Middle Prehistoric Period is generally coeval with an altithermal climatic period on the Plains.
This warmer, drier climatic cycle is most often viewed as an extension of the altithermal period documented in the Great Basin by Antevs (1948).

A cultural complex with broad side-notched projectile point forms known as Oxbow existed in the earliest stages of this period. Frison (1978:45) placed the appearance of Oxbow groups even earlier (ca 5,000 B.C.). Cultural traits associated with Oxbow sites are just now being discovered. The Oxbow complex requires a more precise definition, although a cultural relationship between eastern Montana and the Canadian plains is suggested on the basis of similar artifacts (Frison 1978:45).

The McKean Complex, in contrast to Oxbow, contains artifacts that suggest a shift in the subsistence base in which vegetal foodstuffs played a more important role. To what extent McKean groups relied on floral resources for food is not well understood. Projectile points associated with the McKean Complex include McKean, Duncan, and Hanna. McKean points are lanceolate forms with indented bases; the Duncan type are more triangular with stems forming sloping shoulders. Normally, Duncan point bases are indented. Forms with distinct shoulders and expanding stems are referred to as Hanna points.

**Late Middle Prehistoric Period** (ca A.D. 1 to ca A.D. 500)

The widespread cultural horizon known as Pelican Lake replaced the McKean complex on the northwestern plains near
the time of Christ (Frison 1978:56 suggests ca 1,000 B.C.). Pelican Lake points are true corner-notched forms with wide open notches forming sharp points at the intersect of blade edges and base. Another and slightly later cultural complex, the Besant Complex, has been identified in this period. Besant points are typically large notched forms with convex, ovate blade edges; notches are broad, shallow U- or V-shaped, and basal thinning and grinding are common. Frison (1978:58) considered the Besant culture to be a sophisticated manifestation of a bison hunting subsistence. Reeves (1970:41-43) felt that Besant postdated Pelican Lake cultures and was contemporary with avonlea during its (Besant's) terminal stages. The archaeological record contains little data about plant food acquisition or processing during this period.

Late Prehistoric Period (ca A.D. 500 to ca A.D. 1,800)

Typologically, this period is recognized by a change in projectile point size, probably resulting from the introduction of the bow and arrow. The earliest type of these small side-notched points is Avonlea, a diminutive side-notched point formed by careful pressure flaking (Kehoe and McCorquodale 1961). Later, a variety of small side-notched, corner-notched, tri-notched, and un-notched points characterize the period. Bison hunting continued, but animals were procured by means of a "jump" rather than by impoundments, traps, or stealth.
Communal bison hunting reached its greatest expression, in terms of efficiency, during the Late Prehistoric Period. Ceramics appeared on the northwestern Plains during the closing stages of the period.

**Historic Period** (A.D. 1,800 to present)

The diffusion of the horse among Plains cultures roughly coincides with the beginning Historic Period. The introduction of the horse altered bison-hunting techniques, trading networks, and settlement patterns. The horse was at least partially responsible for an acceleration of diffused cultural traits and for increased intertribal warfare. The Historic Period is marked by the presence of European or white American trade goods in Plains sites.
CHAPTER V
PREVIOUS RESEARCH IN THE STUDY AREA

During the four year period 1972 - 1975, the U.S. Dept. of Agriculture, Forest Service, and the U.S. Dept. of Interior, Bureau of Land Management sponsored four (2 each) cultural resource inventories in the pine parkland breaks adjacent to the Tongue River drainage located in southeastern Montana (Haberman 1973; Beckes 1974; McLean 1975; Davis 1976).

Analyses of surficial artifacts recovered from archaeological inventories often produce data that bear on questions relating to the settlement/subsistence patterns of prehistoric peoples. In attempts to explain their material, each of the above researchers proposed general hypotheses concerning man's prehistoric adaptation and exploitation of environmental resources in the area. Not one of the studies was designed to recover data to test specific hypotheses that had been developed before survey. Rudimentary deductive methods were employed after the fact in some cases (Beckes 1974; McLean 1975); however, inductive reasoning and impartial observation prevail.

Loendorf (1970) proposed a hypothesis of prehistoric settlement/subsistence patterns in the general vicinity. He hypothesized that prehistoric groups practiced a seasonal transhumance settlement/subsistence pattern based on the availability of resources among distinct environmental zones. Loendorf's model (1970), from the Pryor Mountains, identified banded environmental zones based on elevation. Relief in the
Ashland Division does not compare to that found in the Pryor Mountains, precluding meaningful comparisons here.

Thomas Haberman was principle investigator for an archaeological inventory of B.L.M. and private lands in the Birney-Decker area of southeastern Montana in 1972. As a result of following site leads and random pedestrian searches, he located and recorded 44 archaeological sites (Haberman 1973). In essence, Haberman hypothesized that empirical archaeological evidence and ethnological analogy suggest a marked shift in the settlement/subsistence patterns for prehistoric cultures within the area, from higher elevations during the Late Middle Prehistoric Period to lower elevations during the Late Prehistoric Period. He attributed the shift in settlement-subsistence patterns to acquisition of the bow and arrow and the horse. Haberman's references to the distribution of sites within each localized environmental niches are obscure. "In transhumance thought, the Birney-Decker area would be considered only one environmental area, or zone, to be utilized in a seasonal round of activities" (Haberman 1973:88).

A 1973 study by Michael R. Beckes was the first concentrated effort to inventory archaeological resources within the confines of the Ashland Division (Ashland and Ft. Howes Ranger Districts) of the Custer National Forest. His research resulted in the location and recording of 86 sites which showed that the area had been occupied by prehistoric populations,
for various purposes, since the Early Prehistoric Period (Beckes 1974). Based on an ordinal matrix analysis of environmental and cultural variables, he suggested that prehistoric groups practiced a "...transhumance pattern which was based primarily on differential exploitations of ecosystems" (Beckes 1974:135). Furthermore, Beckes (1975:133) suggested that ecozones at higher elevations were the "...preferred zone of occupation during the Middle Prehistoric Period because of the ...greatest diversity of environmental resource of any ecozone in the study area". He also suggested that prehistoric populations shifted their occupational preference from higher elevations to lowlands due to technological changes including the bow and arrow, and acquisition of the horse as described by Haberman (1973).

The following year I was principal investigator for an archaeological inventory of the Ashland Ranger District, Custer National Forest. During my investigation (McLean 1975), 103 archaeological sites were located and recorded. The distribution of sites by elevation and distance to water was subjected to computerized multiple regression analysis using a statistical program called OMNITAB. This analysis indicated a strong correlation between site location and proximity to potable water. Analysis of site location and elevation failed to demonstrate a significant relationship between the two, and other influences are inferred (McLean 1975:114).
In 1974 my hypotheses about possible relationships between site frequencies and ecozones stemmed from the impressions I developed on review of tables illustrating site distribution by ecozone. I have suggested (McLean 1974) that a localized transhumance settlement/subsistence pattern was unlikely, and that there was no cultural preference for the occupation of different ecozones throughout time.

A BLM-sponsored archaeological inventory of properties in southeastern Montana, where that agency controls mineral rights, was conducted by Carl M. Davis. This was the first "quasi-unbiased" inventory approach in the area. A majority of the study area is adjacent to the Ashland Division, Custer National Forest. Davis employed a twofold approach. A sampling technique based on the random selection of legal locations (sections) was used in an attempt to provide unbiased information on site locations. A subjective portion of the research design "chose an equal number of sections ...based on the site density patterns derived from previous archaeological studies" (Davis 1976:2) in an effort to validate early hypotheses (Beckes 1974; Haberman 1973; McLean 1975).

Davis, like Haberman (1974) viewed the Forest environment of the Ashland Division and adjacent valley bottoms as a single environmental setting which was inhabited by prehistoric cultures. His data are not supportive of a shift in settlement-subsistence patterns as suggested by Haberman (1974) and...
Beckes (1975). If anything, his results favor the opposite. In summary he indicated a prehistoric settlement/subsistence pattern in which prehistoric inhabitants tended to occupy ecozones found on low-lying terraces and bluffs, "...but not to the exclusion of others" (Davis 1976:179).

In review, we have a situation in which four independent archaeological inventories of similar local environments in southeastern Montana have resulted in the proposal of four separate hypotheses regarding the settlement subsistence patterns in prehistoric cultures. Taken collectively they may be viewed as two pivotal themes. Beckes and Haberman suggested a cultural preference for the occupation of higher elevations during earlier times with a shift in emphasis to valley bottoms with the advent of the horse and bow and arrow. Beckes also proposed a localized transhumance settlement-subsistence pattern. Conversely McLean and Davis rejected the idea of a shift in prehistoric occupational preferences resulting from changes in technology (i.e. bow and arrow, and the horse), and both question the idea of localized transhumance patterns.
The 1974 Inventory

Beckes' 1973 cultural resource inventory of the Ashland Division provided evidence of considerable prehistoric human activities in the area. However, additional locational information was desirable. Beckes' research had focused on the southern half of the Division (the Ft. Howes District), and he relied to some extent on the knowledge of local informants. The Ashland District Ranger wanted a more comprehensive inventory of the archaeological resources within his District for future direction and management purposes. Because of these factors my 1974 study was limited to an assessment of the archaeological resource of the Ashland District. The objective of the study was to provide land managers with preliminary indications as to where archaeological sites were likely to be located and to make recommendations concerning future management direction for sites located during the study. The agency lacked funds for intensive research; they simply wanted an idea of the number and distribution of archaeological resources on the District.

In response to these needs, and cognizant of the limitations involved, I kept the research design for the archaeological inventory simple. My initial efforts were not designed to test pre-inventory hypotheses or to discover distinctive cultural traits or processes. The design called for
extensive searches for archaeological remains throughout the Ashland District. Because there was so much land involved, my field survey procedures were designed to maximize areal coverage. The time element and ubiquitous nature of prehistoric cultural materials present in the study area required that site recordings be brief.

Two aspects of the survey techniques used during the inventory are critical to my analysis and the discussion of the results, i.e., the "randomness" of pedestrian searches, and the methods of site recording.

Pedestrian searches were not made relative to predetermined selected tracts of land or transects generated by a number table. The searches were random in the sense that I randomly traversed relatively large blocks of land which included all of the ecozones defined in the Ashland Plan (USDA Forest Service 1978). I made a conscious effort to sample environmental zones proportionate with their occurrence. I traversed tops, bottoms and slopes with equal care. Although I did not keep detailed records as to numbers of acres in each ecozone that were examined, on review of my field notes, I am certain that the pedestrian searches were both random and proportionate to the ecozone distribution.

Site recording and artifact collection techniques place certain constraints on the scope (not reliability) of meaningful analysis. Whenever recording a particular site, I made
field notes that contained all readily observable features including topography, vegetation, availability of water, artifact assemblages, erosion and other salient features, both cultural and non-cultural. A representative sample of surface artifacts was collected from each site. Artifacts were not collected systematically relative to a datum or grid, nor was there an attempt to collect a qualitatively representative sample of some artifact classifications. However, I did make a conscious effort to collect all observable "finished" tools (i.e. spent cores, side-scrapers, end-scrapers, bifaces, burins, and projectile points). At least one sample of each of the artifact classes present on the site was collected. I also took at least one sample of artifact material. Artifacts representing by-products of each kind of the lithic reduction process (i.e. unworked flakes, spalls, fine chipping debris, etc.) or those exhibiting limited or ephemeral use (marginally worked flakes) were not collected proportionate with their occurrence.

Of the 103 sites recorded, only five contain surface archaeological features in addition to the chipped-stone artifact assemblage. Consequently, the distribution of chipped-stone artifacts will be used for analysis. In fact only "finished" tools will be considered for statistical analysis and subsequent inferences. I will present some non-qualitative data in descriptive form in an attempt to generate hypotheses for future testing.
Introduction. Archaeology, in its simplest definition, is a technique for doing anthropology ... the study of people or "culture". But archaeologists do not study people, they study the physical remnants of human activity - tools, clothing, dwellings, religious objects, faunal remains, fire hearths, etc. Archaeologists observe, collect, and record samples of objects or features present at the site. While they usually do not collect all evidences of human activity, they can collect a part of a population that reflects characteristics of the total population. In any site a great deal of evidence has been lost or destroyed. Organic evidence may have decomposed, a prehistoric inhabitant may have removed evidence, or a modern day collector may have taken away some of the evidence to add to his wall display in the den.

Archaeologists often organize their cultural material into different categories or classifications based on a set of morphological and/or biological traits. In doing so, they generate a set of data composed of their observations on one or more variables. The objects themselves do not represent a set of data, rather their numerical description usually constitutes the data. Statistical analysis involves the logical manipulation of numerical data (sample variables) in order to arrive at statements concerning central tendencies (mean, mode, and median) or dispersion, the tendency of variables to disperse around the central tendency (Thomas 1976).
Since archaeologists study sampled data, statistical analysis is a legitimate part of their tool kit. By using statistics to analyze data, archaeologists are able to support inferences that they might make about human behavior. It is the position here that statistical analysis of surficial cultural evidence is well suited for the study of the subsistence/settlement patterns of prehistoric peoples. Evidence found on the surface of archaeological sites in the Ashland Division has been shown to reflect, at least to some extent, evidence located below the surface (McLean 1976:92-96).

Descriptive statistical analysis involves studying the numerical distribution of a set of data illustrating tendencies and dispersions. Information on tendencies and dispersion is easily portrayed in graphic form. Inferential statistics takes the analysis one step further, allowing the researcher to generalize about the population based on a sample. This type of analysis can lend either support or repudiation to ideas about cultural behavior. Both descriptive and inferential statistical analysis will be used in this paper.

Using data from the artifact samples collected during my 1974 archaeological inventory, I propose to employ simple non-parametric statistical analysis to address prehistoric human settlement/subsistence patterns within the several environments in the Ashland District, Custer National Forest. Parametric statistical analysis is inappropriate if one
considers the scope of the original study. For example, a primary constraint to application of parametric statistical analysis is the manner in which samples were collected. Parametric analysis assumes specified distributions, a situation which does not exist in this case.

While the quality of data is incompatible for studies of intra-site variability or intricate cultural processes, it is however sufficient for the analysis of general settlement-subsistence patterns if one applies non-parametric statistics. Non-parametric statistics are useful when certain conditions can be met:

A statistic is non-parametric if any one of the following conditions apply.

1. The statistic can be used on nominal scale data; or
2. The statistic can be used on ordinal scale data; or
3. The statistic can be used on a random variable of unspecified distribution.

The first two conditions address the use of nominally and ordinally scaled variables. These are especially important for anthropologists, who are often forced to deal with less precise scales of measurement. The third condition, that data can arise from a distribution of unspecified shape, has led some statisticians to call these tests 'distribution free' (Thomas 1976:262).

All three conditions apply to the data from my 1974 observations, and non-parametric statistical analysis is appropriate here. It is generally accepted that parametric analysis is preferable but, in this case the data are insufficient for prudent application of parametric statistics.
My purpose here is to search for cultural regularities in settlement/subsistence patterns as manifest in the artifact distribution across ecozones. Descriptive and inferential statistics will be used to demonstrate non-random regularities and to support hypotheses concerning their distribution.

Objectives. As mentioned earlier, four archaeological inventories of lands within and adjacent to the Ashland Division, Custer National Forest, led to some preliminary suggestions about prehistoric human settlement/subsistence patterns. All the generated hypotheses are derived from the distribution of chipped-stone artifacts as they occur in different extant environmental conditions with reference to the particular study and/or other archaeological research in the general area. Of particular import are hypotheses suggesting:

1. Prehistoric human groups practiced a localized transhumance pattern of settlement/subsistence to exploit natural resources available in different environmental settings.

2. There was a marked shift in human settlement-subsistence patterns between the Late Middle Prehistoric and Late Prehistoric Periods specifically, a shift in occupational preference from higher to lower elevations some time around A.D. 500.
The data from my 1974 inventory will be examined to see if it supports these hypotheses. A second objective is to examine the data for possible explanations relating to the distribution of cultural materials. I realize that this process will probably generate as many or more questions than it answers.

**Procedures** On my review of the sampled evidence recovered from the 1974 study it was readily apparent that chipped-stone artifacts constitute the only cultural element legitimately applicable to statistical analysis which would allow me to formulate prehistoric human settlement/subsistence patterns. The paucity of archaeological features (dwelling remnants, firehearths, middens, etc.), and the absence of perishable, functionally diagnostic cultural items (bone, wood, skin, foodstuffs, etc.) negate their inclusion in my analysis. Furthermore, sampling techniques were such that only portions of the collective chipped-stone artifact assemblage are appropriate for use in the analysis. Due to the lack of a systematic collection of chipped-stone artifacts exhibiting limited use or potential use (i.e. marginally worked flakes) or of those artifacts representing lithic reduction residues (i.e. unworked flakes and spalls, and fine chipping debris), these classes of artifacts have been excluded from the statistical sample. This leaves us with artifacts that are classified as "finished" tools for analytical purposes. The
sample population of "finished" tools is appropriate for statistical analysis here because they were collected in a systematic, repeatable manner and because they reflect specific cultural practices notwithstanding aberrant use (Semenov 1964:6). The proportional distribution of ecozones within the Ashland District boundary is critical to the analytical processes employed here, therefore, all samples obtained from sites outside the District are excluded.

Each "finished" artifact sample was classified according to morphological attributes; functional interpretations for each of the individual classes identified follows Semenov (1964). In this manner I identified six individual classes of artifacts; burins, spent cores, end-scrapers, side-scrapers, non-projectile bifaces, and projectile points.

Functionally, these artifact classifications can be compressed into two broad classes of cultural activities; hunting/butchering and domestic. Side-scrapers, non-projectile bifaces, and projectile points normally reflect cultural activities associated with the procurement and processing of animal resources while end-scrapers, burins, and spent cores are normally found in a more domestic setting reflecting cultural activities such as hide working, and the manufacture of clothing and utensils. When functional interpretations were questionable, the sample was excluded. Projectile points and projectile point fragments were classified according to established chronological typologies (Mulloy 1958, Wormington
and Forbis 1965, Frison 1978). Those projectile point fragments which lacked diagnostic characteristics (the base and/or stem) were also excluded from the statistical population. All cultural materials recovered from sites located on private land were also excluded because these lands were not included in the Forest Service's "ecozone" study.

Another salient feature of the statistical analysis is the proportional distribution of ecozones within the study area. Although ten distinct ecozones were established as a result of the Forest Service's environmental research, I did not deem it feasible to use ten ecozones in my analysis. First of all, when the 1974 archaeological study was conducted, researchers had only identified nine ecozones. Moreover in 1974, no lands within the Ashland District were classified as falling into ecozones eight and nine. Supplementary research disclosed the presence of a tenth ecozone (Upland Prairie Bunchgrass), and the presence of small, isolated parcels of land which were eventually classified as belonging to ecozones eight and nine. The addition of ecozone ten posed no problem as only a miniscule amount (114 acres) of the land within the Ashland District is classified as such. The problem of ecozones eight and nine is a different story. To compound the problem, the areal distribution of ecozones in acre figures is only available from Ashland District allotment records. These records make no differentiation between the Creek Bottom and
Creek Terrace ecozones (ecozones one and two), and they lump together the Creek Terrace and Lower Slope Fan/Terrace ecozones identified prior to 1975. This leaves us little choice but to consider them as two variables rather than the three variables identified when the archaeological study was conducted. Given the above circumstances, I have pooled all of the ecozones into three environmental variables which I will refer to as Areas A, B, and C.

Area A includes the Creek Bottom, Creek Terrace, and Lower Slope Fan/Terrace as originally defined. Area B consists of the Scoria/Sandstone Outcrop, Dry Slope Ponderosa Pine, and Moist Slope Ponderosa Pine ecozones. Area C includes the Upland Prairie Sage, Upland Prairie Grass and Grassland Park ecozones, as originally defined.

Consolidating the ecozones into fewer categories undoubtedly masks the more subtle aspects of prehistoric cultural activities as they occur throughout the overall environment, yet pooling of these variables has certain advantages. It permits a panoramic view of prehistoric man's adaptation to, and exploitation of, the study area environment. These larger ecozone categories are consistent representations of the general topography and vegetation patterns to the extent that they almost appear to be intrinsic (Figure 4). This tripartition is also comprehensible to those not familiar with the localized ecozone concept.
I consulted with Dr. Melvin S. Morris, Professor Emeritus, Department of Forestry, University of Montana, about the validity of merging the ecozones in this manner for my analysis. Dr. Morris (1981) viewed the pooled ecozones outlined above as being as equitable scheme considering the scope of my analysis. He hastened to point out that this classification system was only useful and legitimate for examining the data in broad terms.

Having established the limitations inherent in the sample variables, I turned to the actual statistical maneuvers that will be used to test hypotheses listed below. I have selected Chi-squared tests as the appropriate level of analysis in this paper. While Chi-squared techniques lack the sophistication of more complicated statistical procedures, they are extremely useful for making inferences concerning quantitative central tendencies (Thomas 1976). I have arbitrarily chosen .05 as the critical value of statistical significance. I make no pretense that the study results are reliable beyond this level. The Yates correction factor (Thomas 1976:279-282) appears to make little difference in the outcome of my Chi-squared results as shown below.
Hypothesis No. 1: Site locations are distributed proportionately to the distribution of ecozones. Before attempting any analysis concerning settlement/subsistence patterns of prehistoric groups in the area, I must first determine whether or not the distribution of sites merely reflects random variation. Prominent, worldwide anthropological research provides ample evidence of the human propensity for habitual behavior. Consequently, I would expect that cultural manifestations are not randomly distributed across the study area ecozones. If they were, we would expect the percentages of sites in each ecozone to correspond to the percentage of ecozones as distributed over the Ashland District. Table 1 illustrates the proportional distribution of ecozones (in acres) as they occur throughout the Ashland District. The distribution of recorded sites and their expected frequencies are shown in Figure 5. I have not lumped the ecozones here in order to insure that my basic hypothesis (archaeological sites are not proportionately distributed) is valid before I make analyses at a broader level.

The Chi-squared value of 50.87 exceeds the upper percentage point of 15.5073 and I can confidently reject the hypothesis that site locations are distributed proportionately to the distribution of ecozones. This would suggest that cultural factors influence the location of archaeological sites. The question now becomes: what cultural factors influence site location? While the answer to this question is
beyond the scope of this paper, I can make some pertinent observations simply by review of the information illustrated in TABLE 1 and FIGURE 5.

The distribution of recorded sites differs most from the expected distribution in ecozones 3, 4, and 6. Ecozones 3 and 4 both contain more sites than I would expect to find, and ecozone 6 contains fewer sites than expected. One possible explanation for there being more sites in ecozones 3 and 4 than is expected is the availability of potable water. Beckes (1974:130) and McLean (1975:114) pointed to the proximity of water as a significant factor in site location. Aside from spring runoff, when ephemeral creeks carry water, the only sources of water on the District proper are springs. Lignite coal beds "...are believed to play a very significant role... through their capacity to serve as limited aquifers" (USDA 1978:27A, 28A). Exposed lignite coal beds are located within the Scoria/Sandstone Outcrop ecozone suggesting that the availability of these sources of water may be one reason pre-historic groups occupied ecozones 3 and 4 more heavily than some others. This appears to be a simple but logical explanation; however, other factors, including the availability of other natural resources, or perhaps the groups socio-religious customs, must also be considered.

The relative scarcity of archaeological materials in the Dry Slope Ponderosa Pine ecozone (zone 6) is perplexing. This ecozone is characterized by warm southern exposures, a sparse
TABLE 1. Proportional distribution of ecozones in the Ashland District, Custer National Forest.

<table>
<thead>
<tr>
<th>ECOZONE</th>
<th>ACRES</th>
<th>% OF STUDY AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Creek Bottom</td>
<td>22,412</td>
<td>.118</td>
</tr>
<tr>
<td>2. Creek Terrace and Lower Slopes</td>
<td>53,909</td>
<td>.261</td>
</tr>
<tr>
<td>3. Lower Slope Fan/Terrace</td>
<td>22,910</td>
<td>.111</td>
</tr>
<tr>
<td>4. Scoria Sandstone Outcrop</td>
<td>17,371</td>
<td>.084</td>
</tr>
<tr>
<td>6. Dry Slope Ponderosa Pine</td>
<td>67,912</td>
<td>.328</td>
</tr>
<tr>
<td>7. Moist Slope Ponderosa Pine</td>
<td>12,665</td>
<td>.061</td>
</tr>
<tr>
<td>8. Upland Prairie (Grass)</td>
<td>3,847</td>
<td>.019</td>
</tr>
<tr>
<td>9. Upland Prairie (Sage)</td>
<td>3,721</td>
<td>.018</td>
</tr>
<tr>
<td>10. Upland Prairie (Bunchgrass)</td>
<td>114</td>
<td>.000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>206,861</td>
<td>1.000</td>
</tr>
</tbody>
</table>

TABLE 2. Chi-squared test results for Hypothesis No. 1.

<table>
<thead>
<tr>
<th>OBSERVED (0)</th>
<th>EXPECTED (E)</th>
<th>(O-E)</th>
<th>(O-E)²</th>
<th>(O-E)² / E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>10.62</td>
<td>-3.62</td>
<td>13.10</td>
</tr>
<tr>
<td>2</td>
<td>34</td>
<td>23.49</td>
<td>10.51</td>
<td>110.46</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>9.99</td>
<td>17.01</td>
<td>289.34</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>7.56</td>
<td>44.19</td>
<td>306.95</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>29.52</td>
<td>-17.52</td>
<td>306.95</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>5.49</td>
<td>-3.49</td>
<td>12.18</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>1.71</td>
<td>1.71</td>
<td>2.92</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>1.62</td>
<td>-1.62</td>
<td>2.62</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 50.87 \]

N = 90
Degree of freedom (df) = 8
Upper percentage point of \( \chi^2 \) at \( .050 = 15.5073 \)
overstory of ponderosa pine, and a diverse understory vegetation. It is considered as one of the most important ecozones in the system for wildlife habitat (USDA Forest Service 1978:9B). These conditions would seem favorable for those groups who practiced a hunting/gathering economy, particularly during late fall, winter, and early spring when the sun's warmth would have been welcomed. Aside from the fact that steep topography precludes chronic occupancy in some areas of this ecozone, I see no readily apparent reason(s) that may account for this discrepancy.

**Hypothesis No. 2:** Prehistoric groups in the area changed their localized pattern of settlement and subsistence based on the availability of certain resources. Now that I have established a non-random proportional distribution of cultural materials within the study area, I can examine evidence germane to the hypothesis concerning a prehistoric transhumance settlement/subsistence pattern. The 1974 sample population will not permit analysis at the individual ecozone level and
my purpose is merely to examine the data in hopes of establishing general cultural tendencies. I am especially interested in prehistoric exploitation of lower and higher elevations of the study area. This analysis also fits well with questions concerning a shift in man's occupational preference from higher to lower elevations. Therefore, I have pooled the ecozones according to topographic settings. By definition, ecozones 1, 2, and 3 (Area A) are found in the bottom and ecozones 4 through 10 (Areas B and C) are located at higher elevations.

Beckes has suggested that prehistoric groups made seasonal changes in their abode "in a regular and traditionally recognized way ...(1974:132)" much like the model Loendorf (1970) has proposed for the Pryor Mountains. He attributed the transhumance pattern to a differential exploitation of resources within specific ecozones (Beckes 1974:135). If this scenario were an accurate representation of prehistoric cultural tendencies, he is, in effect, assuming that these people were occupying the various ecozones for different purposes. I would expect changes in the respective toolkits found in the archaeological record to reflect these different purposes. One way to test the hypothesis of transhumance is to look at the spatial distribution of functional tool types. My artifacts fall into two broad activity categories; domestic and hunting/butchering. End-scrapers and burins are primarily used for processing hide, bone and wood, while bifaces, sidescrapers and projectile points normally indicate hunting-butchering activities (Semenov 1964). Spent cores are not
necessarily used for specific purposes, but they are usually associated with domestic locales. In a situation of a transhumance settlement/subsistence economic mode, the ratio of these broad categories should differ significantly. TABLE III illustrates the chi-squared outcome of the distribution of domestic assemblages between lower and higher elevations based on sample variables shown in FIGURE 6.

The chi-squared value of .0057 does not exceed the rejection value of 3.841, indicating that the two ecozones are virtually identical so far as the distribution of chipped-stone tools used for domestic activities are concerned. Since I only have two classes of artifacts (domestic and hunting-butcher ing), we can assume that the reciprocal chi-squared value (i.e. that hunting/butchering chipped-stone tools are also evenly distributed) holds true and, indeed it does.

I do not consider the above as definitive evidence against the concept of a prehistoric transhumance settlement/subsistence pattern. In fact all I have demonstrated is the fact that the data indicate that domestic and hunting/butchering activities (e.g. gathering and/or processing of vegetal food stuffs) or other factors which may have masked positive indications of transhumance settlement/subsistence patterns. One element that may have an influence on this chi-squared result is time. Although the sample population attributable to specific time periods is limited, it may provide some insights regarding the time element.
TABLE 3. Chi-squared test results for Hypothesis No. 2.

<table>
<thead>
<tr>
<th>Provenience</th>
<th>All Classified Chipped-stone Tools</th>
<th>Domestic Chipped-stone Tools</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>77</td>
<td>25</td>
<td>.3247</td>
</tr>
<tr>
<td>BC</td>
<td>91</td>
<td>29</td>
<td>.3187</td>
</tr>
</tbody>
</table>

\[
\text{Observed (O)} \quad \text{Expected (E)} \quad (O-E) \quad \frac{(O-E)^2}{E}
\]

\[
\begin{align*}
\text{A} & \quad 25 & \quad .32 \times 77 = 24.75 & \quad .36 & \quad .1296 & \quad .0025 \\
\text{BC} & \quad 29 & \quad .32 \times 91 = 29.25 & \quad -.12 & \quad .0144 & \quad .0021
\end{align*}
\]

\[
\chi^2 = .0046
\]

N = 54

Degree of freedom (df) = 1

Upper percentage point of \( \chi^2 \) at .050 = 3.841

FIGURE 6 - Observed and expected distribution of domestic chipped-stone artifacts (spent cores, end-scrapers, and burins) on the Ashland District, Custer National Forest (McLean 1975).
Hypothesis No. 3: The ratio of domestic to hunting-butchering tools is identical in Areas A and BC during the Late Middle Prehistoric Period. Widespread archaeological evidence from the Northwestern Plains indicates that over time, recognizable shifts occurred in prehistoric economic pursuits, especially in the relative importance of hunting as opposed to collecting of vegetable resources. A shift in economics over time could be one explanation for the equal distribution of domestic chipped-stone tools in both the higher and lower elevations of the study area. Although the 1974 research data suggests a universal and equitable domestic settlement pattern, a marked shift in residential preference between different time periods could result in a parallel distribution of domestic artifacts. Data from the 1974 inventory provides some insight on the subject.

The chi-square value of .0672 does not exceed the rejection level of 3.841 at the level of significance and I accept the hypothesis that the ratio of chipped-stone domestic tools to chipped-stone hunting/butchering tools is identical in Areas A and BC. It would be beneficial if a similar test were made using the ratio of domestic to hunting/butchering tools associated with other time periods. Unfortunately the number of sites associated with temporally diagnostic artifacts (projectile points) from Early, Early Middle, and Late Prehistoric Periods (1, 3, and 5 respectively) is too small for meaningful comparison.
TABLE 4. Chi-squared test results for Hypothesis No. 3.

<table>
<thead>
<tr>
<th>Observed (O)</th>
<th>Expected (E)</th>
<th>O-E</th>
<th>$(O-E)^2$</th>
<th>$\frac{(O-E)^2}{E}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>$9 \times 16 + 29 = 4.966$</td>
<td>-.966</td>
<td>.933</td>
<td>.18788</td>
</tr>
<tr>
<td>12</td>
<td>$20 \times 16 + 29 = 11.034$</td>
<td>.966</td>
<td>.933</td>
<td>.08456</td>
</tr>
<tr>
<td>5</td>
<td>$9 \times 13 + 29 = 4.035$</td>
<td>.965</td>
<td>.931</td>
<td>.23073</td>
</tr>
<tr>
<td>8</td>
<td>$20 \times 13 + 29 = 8.966$</td>
<td>-.966</td>
<td>.933</td>
<td>.10406</td>
</tr>
</tbody>
</table>

$x^2 = .60723$

$N = 29$

Degree of freedom (df) = 1

Upper percentage point of $x^2$ at .050 = 3.841

FIGURE 7 - Distribution of domestic and hunting/butchering chipped-stone artifacts from the Late Middle Prehistoric Period archaeological sites (McLean 1975).
Hypothesis No. 4: The proportional distribution of Late Middle and Late Middle Prehistoric Period projectile points is equal in Areas A and BC. The four archaeological inventories referenced in Chapter V (Previous Research) have led to two different hypothesis concerning settlement/subsistence patterns during the Late Middle and Late Prehistoric Periods. Beckes (1974) and Haberman (1973) felt their data reflected a noticeable shift in prehistoric cultural occupations from higher to lower elevations during the Late Middle Prehistoric Period. The shift in occupational preference is reported to be the result of acquisition of the bow and arrow and the horse.

Due to the lack of substantial chronological evidence from several time periods, the data base from the 1974 archaeological inventory is insufficient for me to address a temporal shift in settlement/subsistence patterns as reflected in the distribution of artifacts. A solution to this dilemma lies in the artifact assemblage reported by Beckes (1974). Until now, I have avoided using data from other studies because the collection techniques of other researchers differ to varying extents from my own. However, the collection technique used by Beckes (1974) of temporally diagnostic projectile points is identical to that employed in my research. That is, Beckes (1974), and McLean (1975)) collected all projectile points observed during their respective studies. Since the sampling techniques are comparable we can legitimately combine these classes of artifacts for statistical purposes.
FIGURE 8 - Distribution of Late Middle Prehistoric Period projectile points from Beckes' (1974) and McLean's (1975) archaeological inventories.

FIGURE 9 - Distribution of Late Prehistoric Period projectile points from Beckes' (1974) and McLean's (1975) archaeological inventories.
FIGURES 8 and 9 illustrate the distribution of Late Middle and Late Prehistoric Period projectile points observed by Beckes (1974) during his archaeological inventory and those observed by McLean (1975).

The chi-squared value of 9.777 is greater than the rejection value of 3.841 at the .050 significance level and I must reject the hypothesis that sites in the Late Middle and Prehistoric Periods are distributed proportionately between Areas A and BC. The chi-squared test fails to provide directional inferences regarding the distribution of sites during the respective cultural horizons. But a glance at the distribution of temporal data from Beckes' and McLean's research (FIGURES 8 and 9) points to a significantly smaller number of Late Prehistoric Period projectile points in lower elevation archaeological sites and a significant larger proportion of Late Middle Prehistoric Period sites. This evidence is in direct opposition to the suggested hypothesis, and in fact implies a shift from lower elevations to higher elevations during the Late Middle and Late Prehistoric Periods. Davis (1975:179) has come to a similar conclusion based on archaeological evidence he collected during his study.

**Hypothesis No. 5:** Lithic workshops are randomly distributed among different ecozones. Previous analysis and discussion here have focused on the distribution of certain
TABLE 5. Chi-squared test results for Hypothesis No. 4.

<table>
<thead>
<tr>
<th>Observed (o)</th>
<th>Expected (E)</th>
<th>O-E</th>
<th>(O-E)^2</th>
<th>(\frac{(O-E)^2}{E})</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>12 x 17 (\neq) 30 = 6.8</td>
<td>4.2</td>
<td>17.64</td>
<td>2.594</td>
</tr>
<tr>
<td>6</td>
<td>18 x 17 (\neq) 30 = 10.2</td>
<td>-4.2</td>
<td>17.64</td>
<td>1.729</td>
</tr>
<tr>
<td>1</td>
<td>12 x 13 (\neq) 30 = 5.2</td>
<td>-4.2</td>
<td>17.64</td>
<td>3.392</td>
</tr>
<tr>
<td>12</td>
<td>18 x 13 (\neq) 30 = 7.8</td>
<td>4.2</td>
<td>17.64</td>
<td>2.262 (\sum x^2 = 9.777)</td>
</tr>
</tbody>
</table>

N = 30
Degree of freedom (df) = 1
Upper percentage point of \(x^2\) at .050 = 3.842

FIGURE 10 - Distribution of lithic workshop sites observed on the Ashland District, Custer National Forest (McLean 1975).
classes of chipped-stone tools whose primary functions are assumed. Implied function derives from analysis of prehistoric lithic technologies (Semenov 1964). We know, based on the ubiquitous presence of artifacts made of porcellanite throughout the study area, that locally available porcellanite was an important raw material source for prehistoric lithic industries. Virtually all archaeological studies in the area (Haberman 1973; Fredlund 1973; Beckes 1974; McLean 1975; Davis 1976; Greiser and Plochman 1981; and others) have noted the presence, if not predominance, of porcellanite (under a variety of names) in the archaeological record. Assuming the importance and utility of porcellanite as a source of lithic raw materials, the distribution of certain classes of porcellanite artifacts will shed additional light on prehistoric cultural activities.

Lithic workshops, where the dominate activity was the initial reduction of raw lithic materials are characterized by the presence of large nodules, cores, spalls, and flakes and the relative absence of formal tool types. Of the ninety archaeological sites discovered on the Ashland District in 1974, thirty sites contained unworked flakes, spalls, and cores of porcellanite. There were no recognizable "finished" tools. The distribution of characteristic lithic workshop sites by ecozone is shown in FIGURE 10. There is a clustering of workshop sites in the intermediate ecozones and few in the ecozones at either end of the spectrum. This suggests
TABLE 6. Chi-squared test results for Hypothesis No. 5.

<table>
<thead>
<tr>
<th>Ecozone</th>
<th>Observed (O)</th>
<th>Expected (E)</th>
<th>O-E</th>
<th>(O-E)^2</th>
<th>(O-E)^2 / E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&amp;2</td>
<td>0</td>
<td>30 x .118* = 3.54</td>
<td>-3.54</td>
<td>12.53</td>
<td>3.54</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>30 x .261* = 7.83</td>
<td>-3.83</td>
<td>14.67</td>
<td>1.87</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>30 x .111* = 3.33</td>
<td>4.67</td>
<td>21.81</td>
<td>6.55</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>30 x .084* = 2.52</td>
<td>6.48</td>
<td>41.99</td>
<td>16.66</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>30 x .328* = 9.84</td>
<td>6.84</td>
<td>46.79</td>
<td>4.76</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>30 x .061* = 1.83</td>
<td>3.17</td>
<td>10.05</td>
<td>5.49</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>30 x .019* = .57</td>
<td>.43</td>
<td>.19</td>
<td>.33</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>30 x .018* = 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>30 x .018* = 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 39.74 \]

N = 30
Degrees of freedom (df) = 8
Upper percentage point of \( \chi^2 \) at .050 = 15.5073
*% of lands in respective ecozones.

that the distribution of lithic workshops is non-random. The
chi-squared test illustrated in TABLE VI verifies the non-
random distribution of lithic workshops.

A non-random distribution of lithic workshops in the
study area is not surprising, nor is the apparent tendency
for them to be located within or near ecozones with dramatic
relief (i.e. ecozones 4, 6, 7, and 8). Porcellanite outcrops
are exposed in the geologic strata of eroded deposits in the
Porcellanite beds are "...most frequently found on the ridgetops or extending down the slope a short distance as talus" (Brown 1971:461). The extraction and preliminary reduction of lithic raw materials into transportable dimensions consumes tremendous human energy. It does not seem likely that prehistoric man would have expended extra effort in transporting large raw material specimens far from their source and my data support this inference. Prehistoric peoples apparently engaged in the procurement and initial reduction of lithic raw materials near porcellanite origins without regard to the location of their residence.
CHAPTER VII
SUMMARY

The evidence I have examined here is hardly exhaustive or particularly intense, nevertheless the study is illuminating with respect to both anthropological theory and cultural resource management practices. Results of the statistical analysis do not conflict with existing prehistoric cultural frameworks which are based on a wider range of archaeological data. They do however, present evidence contrary to some hypotheses relative to prehistoric human settlement/subsistence patterns in the pine parkland environment of southeastern Montana. Although this paper confirms the applicability of using data which were collected for management purposes for anthropological problem-solving, inherent shortcomings in my 1974 research illustrate the need for stringent inventory practices if we propose to use the data in more definitive theoretical modes.

It is generally accepted that prehistoric cultures in southeastern Montana were characterized by small nomadic bands of hunter/gatherers who made annual rounds to exploit various natural resources. Archaeological evidence (Mulloy 1958; Frison 1978) clearly demonstrates that prehistoric cultures relied heavily on large game animals (not to the exclusion of smaller animals) for subsistence.

The relative absence of evidence associated with gathering and processing vegetable resources leaves unanswered the question of the importance of vegetable foodstuffs to groups
occupying the area. This discrepancy may be more apparent than real. As Frison (1978:369) pointed out; "The best interpretation at the present time is that a widespread dependence on plant food characterized much of prehistoric human life on the Northwestern Plains."

Data from my 1974 investigation fit well into the cultural frameworks devised by Mulloy (1958) and Frison (1978). The chipped-stone tool assemblage recovered by me is consistent with the tool-kits used by nomadic hunters and gatherers. No cultural features were observed that would indicate more sedentary settlement patterns. In this sense then, I have added little to the collective knowledge of prehistoric cultural activities over the broad expanse of the northwestern Plains, except to demonstrate that the area was extensively occupied by groups of prehistoric nomadic cultures. On the other hand, the 1974 archaeological inventory results do have import on our perception of localized cultural settlement-subistence patterns of prehistoric groups in the Ashland District, Custer National Forest.

Two fundamental hypotheses presented earlier have been analysed using non-parametrical statistical techniques and sample data from the 1974 study. Basically the statistical results suggest:

1. that prehistoric cultures did not follow a recognizable local transhumance settlement/subsistence pattern based on a differential exploitation of
resources characteristically found in various ecozones;

2. prehistoric groups did not make a dramatic shift in their settlement patterns from higher to lower elevations during the Late Prehistoric Periods. In fact the data suggest a shift from lower to higher elevations during this Period.

I firmly believe that my 1974 research results accurately portray prehistoric man's settlement/subsistence patterns of the study area; however, there are several explanations which may account for opposite hypotheses cited by other researchers who have made comparable research in the vicinity. Foremost is the relatively small, but perceptible environmental differences between the areas under investigation. While Beckes' study (1974) included the inventory of some lands within the Ashland District, he spent a good deal of time inventorying archaeological sites located on the southern half of the Ashland Division (i.e. the Fort Howes Ranger District).

The environment of the southern half of the Ashland Division differs from that found in the northern half, primarily in the amounts of lands classified as ecozones 8, 9, and 10. The Fort Howes Ranger District contains extensive areas of sandstone butte tops and associated grasslands, a condition that does not exist on the Ashland District. I would expect that the proportional differences in ecozone
variables might have an effect on statistical outcomes. When one goes further afield to more remote areas (e.g. the Birney-Decker Area) there are greater problems of comparability, especially so since those lands have not been formally classified based on a similar ecozone system.

Another plausible explanation for the apparent discrepancies in the archaeological record from inventories conducted in similar environments is the difference in field inventory techniques. Haberman (1973), Beckes (1974), McLean (1975) did not employ strict, predesigned pedestrian search strategies in their research. While they may have been internally consistent, they were not designed to address specific anthropological questions, nor were they designed to cover the respective study areas in a systematic fashion. That is, they did not conduct pedestrian searches in quantifiable discrete units (e.g. a grid or transect system). Davis' study (1975) was partially based on the inventory of randomly selected sample areas, but he spent an equal amount of effort investigating areas where archaeological sites were suspected to exist based on data from the results of Haberman's (1973), Beckes' (1974), and McLean's (1975) work.

I find it difficult to accept the hypothesis that prehistoric peoples practiced a seasonal transhumance settlement-subsistence pattern within the environment of the Ashland Division of Custer National Forest. Not only do my data
reject the idea, but intuitively I question whether or not the expense of human energies required to move residences is justifiable when all localized environmental conditions are found within short distances of one another. My feelings are not quite so adament with regard to the shift in settlement patterns suggested by Haberman (1973), and Becke's (1974), but I am still not convinced such a transformation actually took place. The idea of a shift in prehistoric settlements from higher elevations to lower elevations where larger, consistent sources of potable water were present, seems reasonable in view of the adaptation to an equestrian lifestyle, but I am uncomfortable with assigning the shift in settlement/subsistence preferences to development of new tool technologies.

I do not want to belabor the point, but I feel it is appropriate to mention the important role sound research strategies play in meaningful archaeological research. The frustrations I experienced in writing this paper stem from the fact that I constantly found myself wanting more definitive, statistically "purer" samples for analysis. Had I spent more time in preparing a research design and less time in actual inventory efforts, I might have been able to make more definitive suggestions, with less exasperation. Because I was personally involved, I realize that cultural resource inventories generated by Federal undertakings necessarily address
management concerns (usually with austere financial backing), but we cannot ignore present or future anthropological concerns. Whether we like it or not, cultural resource inventories and subsequent research are in the forefront of archaeological research today (Schiffer 1977) in the United States. We should take advantage of the opportunities created by various environmental laws not only for proper management of cultural resources, but also in the interest of anthropological inquiry.
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<thead>
<tr>
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<th>Year</th>
<th>Title</th>
<th>Notes</th>
</tr>
</thead>
</table>
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