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APPENDIX C

MARCH 1973 CONTENTS

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WYOMING
ARCHAEOLOGICAL SOCIETY, INC.

Cheyenne, Wyoming

Dear Fellow Members:

The 1973 Annual State Meeting will be held at the Holiday Inn, Casper, Wyoming.

<u>SCHEDULE</u>

Friday, April 6 - Pre-Conference Meeting
8:00 p.m. - An open session for Chapter Officers, Delegates, as well as for any Society Member with a proposal requiring a vote by Chapter Delegates

Saturday, April 7 - Annual Meeting
8:00 a.m.-9:30 a.m. - Registration - Get Banquet Tickets - Set up Displays and certify Voting Delegates
9:30 a.m.-Noon - General Business, Chapter, and Committee Reports
Noon - 1:30 p.m.- No Host Luncheon
1:30 p.m.-4:30 p.m. - Archaeological Site Presentations
4:30 p.m.-5:00 p.m. - Election of Officers and Summer Meeting Site
5:00 p.m.-7:00 p.m. - Recess and Removal of Displays
7:00 p.m.-9:00 p.m. - Evening Banquet and Guest Speaker

Sunday, April 8 - Wyoming Archaeological Foundation Directors
Standing Committee Meetings if desired

Please bring artifact displays and give me a brief description so they can be properly acknowledged.

I wish, especially, that new members of each Chapter would make a special effort to attend the State Meeting. Your membership will increase in stature in direct proportion to your participation. Besides, we just have a whale of a good time!

Sincerely,

Grant

A CRITIQUE

By Mark Miller

Touch the Earth, compiled by T. C. McLuhan, displays emotional accounts of actual Indian responses to the latter 19th century expansion of the White man into the Indians' native country. Selected quotes of famous and discreet individuals with various tribal backgrounds, but similar attitudes toward the intrusion of White manifest destiny, make up this record of a self-portrait of Indian Existence. The Indians see this expansion as not only a breach of treaties, but also an infringement on their life style and a never ending force destroying the harmonious fusion between the Indian and nature.

This frustrated reaction to White American Intrusion, however valid it may be, has been exclusively the topic of this text. I feel that if this common idea of exposing the reaction to outside contact among the Indians is the theme, the book should not limit itself to the more widely known instances in the United States, but should overview the problem as faced by a better representative sample of cultures within the whole of North America and possibly South America and Central America, (though these areas aren't emphasized in our course). One of the most unfortunate elements of White intrusion was the bringing of disease, which wasn't stressed in the book.

McLuhan's book is subtitled: "A Self-Portrait of Indian Existence." This subtitle implies that the "Indian", (as an inclusive generalization), is adequately represented in this book and that they were all subjugated to the land, soul and life losses that are repeatedly expressed in McLuhan's theme. What of the tribes that suffered less from movements to reservations far from their homeland, as the Western Apache now living in the general area of their pre-reservation occupation. Some tribes never even saw a treaty, let alone witness the breach of one as in the case of the Basin Washo of the Lake Tahoe area. Why weren't these groups and situations considered along with an explanation of the White man's diseases and their enormous toll?

Maybe the book was to awaken the reader to the atrocities we subjugated the Indians to, but this, alone, is as wrong as when we performed the atrocities, because then, as now in this book, the whole story is not present. If we had understood the Indians' cultures more, then history may have been altered. If McLuhan had compiled quotes of Indians not as stereotyped in their reaction to subjugation, her book would have more perspective and the self-portrait of Indian existence would be better outlined.

Two good points of the book deserve note: It definitely expresses the Indians' identification and harmony with nature which was intended, and alluded to by the title, Touch the Earth. Also, the photography by Edward S. Curtis, taken in the early twentieth century is excellent and accents the book beautifully.

McLuhan's account has awakened me to the continuous struggle of a heritage and a people to preserve their respect and to live a fulfilling, purposeful life. The fourth chapter, "If We Surrender We Die," has done more than other areas of the book to express, to me, the intense sincerity of the Indian people to again touch the earth and live with their right to be proud.

A SURVEY OF CERAMIC SITES
IN SOUTHEASTERN WYOMING

by

Charles A. Reher

A THESIS

SUBMITTED TO THE DEPARTMENT

OF ANTHROPOLOGY AND THE

GRADUATE SCHOOL OF THE UNIVERSITY OF WYOMING

IN PARTIAL FULFILLMENT OF REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

University of Wyoming

Laramie, Wyoming

May, 1971

ABSTRACT

A SURVEY OF CERAMIC SITES IN SOUTHEASTERN WYOMING

By Charles A. Reher, M.A.,
Department of Anthropology

An archaeological survey in southeastern Wyoming revealed thirty-one ceramic sites. The principal area of investigation included eastern Laramie County and southern Goshen County. Pottery was also obtained from sites in western Laramie County, northern Goshen County, Albany County and Platte County. Fourteen other ceramic sites in southeastern Wyoming are mentioned in previous publications.

Test excavations were conducted at four sites and the material recovered is described. A brief description of surveyed sites and surface materials from each is also included. Affiliations with Plains Woodland, Upper Republican and Dismal River cultures are indicated.

Most sites were located in escarpment systems along principal drainages. The additional resources of wood, water, shelter, and plant and animal foods found in such an environment were apparently a major factor in prehistoric utilization of the High Plains.

ACKNOWLEDGEMENTS

The author wishes to express his gratitude to Dr. George C. Frison, who directed this thesis and gave assistance and patience far beyond normal requirements. The writer was also fortunate in having on his committee Dr. William Mulloy, one of the foremost authorities on Plains archaeology, and Dr. Brainerd Mears, who gave much needed advise on the geology used in this thesis. Dr. Raymond Wood and Dr. David Breternitz also offered helpful suggestions and other types of aid.

Mr. Grant Willson and Mr. Louis Steege of Cheyenne helped in locating several sites and contributed artifacts for use in this study, and their support is gratefully acknowledged here. The help of Mr. Harry Haywood, Mr. Jamie Willson, Mr. Mark Hutchins, and Mr. Paul Reher on several excavations is greatly appreciated. Others who assisted during excavations include George Zeimens, Wally Brown, Brad White, Steve Deines and George Eckland.

The writer is indebted to numerous landowners for allowing access to their property, and especially to Mr. and Mrs. Irvin Petsch, Mr. and Mrs. Fred Petsch and Mr. and Mrs. Bernie Moritz for permission to conduct excavations.

And finally, special gratitude is reserved for my wife Sandra, who displayed amazing skill as a screener, cataloger, typist, editor and critic, and did all this while taking care of the house, the author, and two small children.

CHAPTER I

INTRODUCTION

This thesis is based on a survey of ceramic sites in southeastern Wyoming. Thirty-one sites were located and test excavations were conducted at four of these sites. Fourteen sites mentioned in earlier publications are also discussed. The area of most intensive investigation included eastern Laramie County and southern Goshen County. In certain areas the reconnaissence extended into the extreme western portions of Kimball and Banner Counties in Nebraska. Material for this study was also obtained from Albany and Platte Counties, Wyoming, and from Weld County, Colorado (Fig. 1).

The Study of Plains Prehistory

For some time prehistoric occupation of the High Plains was thought to be almost impossible without the horse. Such ideas had been prevalent since the 19th Century, when this area had been included in the "Great American Desert". In 1842 Fremont paused between Horse Creek and Lodgepole Creek in southeastern Wyoming and wrote:

> On the peak of the ridge where I was standing, some six or seven hundred feet above the river, the wind was high and bleak; the barren and arid country seemed as if it had been swept by fires, and in every direction the same dull ash-colored hue derived from its formation met the eye. On the summits were some stunted pines, many of them dead, all wearing the same ashen hue of desolation (Nevins 1965:125).

One of the first scholars to consider the prehistoric basis of historic Plains tribes was Clark Wissler. He admitted that archaeological knowledge of the area was not sufficient to justify any assumptions but spoke of a "prehistoric uninhabited region" on the more western Plains (1908:201). In his later writings he recognized that the horse intensified and helped diffuse pre-existing traits, but still does not postulate any great time depth for these traits (1914:25).

Kroeber stated similar ideas with even fewer reservations:

> The largely negative results of archaeology indicate the Plains as only sparsely populated or intermittently inhabited for a long time. The population was probably in the main a woodland one along the eastern margin...The western Plains on the whole were still little utilized in this early period. Some Basin and Plateau groups had spilled over, but kept essentially to the base of the Rocky Mountains (1928:394).

Figure 1. Ceramic sites in southeastern Wyoming

1. 48 GO 304
2. 48 GO 303
3. Lone Tree Canyon Site
4. Fox Creek Site
5. Eagle Rock Site 48 GO 301
6. Castle Rock Site 48 GO 302
7. 48 LA 320
8. Upper JHD Site 48 LA 314
9. Pull Springs Site 48 LA 315
10. Gurney Peak Bench Site 48 LA 302
11. Gurney Peak Butte Site 48 LA 305
12. Steamboat Rock Site 48 LA 313
13. Petsch Springs Site 48 LA 303
14. 48 LA 317
15. 48 LA 316
16. 48 LA 311
17. 48 LA 309
18. 48 LA 306
19. Pine Bluffs Site 48 LA 312
20. 48 LA 307
21. 48 LA 308
22. 48 LA 318
23. 48 LA 310
24. 48 LA 319
25. Seven Mile Point Site 48 LA 304
26. Chalk Bluffs Site
27. Willotson Ranch Site
45. Red Buttes Site
46. Elk Mountain Site
28. Dig Hole Site
29. Willow Springs Site 48 AB 302
30. Chugwater Site
31. Rawhide Buttes Site

Approximate locations from Gunnerson (1960:222,236-237):

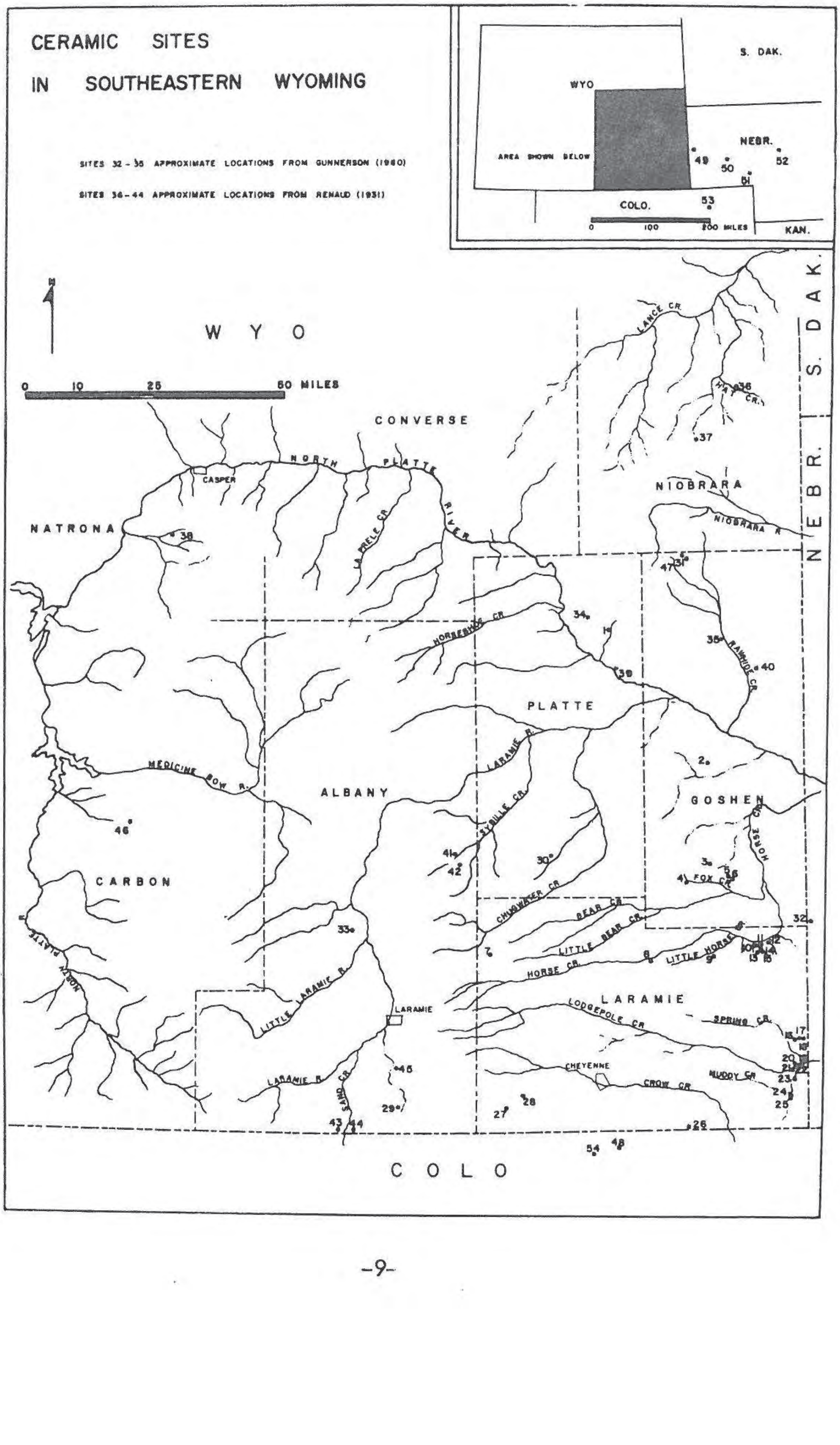
32. Bull Canyon Site 25 NA2
33. AA:6:1
34. 48 PL 11
35. U:11:2

Approximate locations from Renand (1931:58-63):

36. W121
37. WX1
38. W58
39. WR88
40. Battleship Hill
41. WR4
42. WR7
43. W22
44. W31
47. Bald Butte

Ceramic sites in neighboring areas in Nebraska and Colorado:

48. Agate Bluff Sites (Irwin and Irwin 1957)
49. Signal Butte Site (Strong 1935)
50. Western Nebraska Rock Shelters (Bell and Cape 1936)
51. Ash Hollow Cave (Champe 1946)
52. Central Nebraska Plains Apache Sites (Cunnerson 1960)
53. Northeastern Colorado Sites (Wood 1967)
54. Happy Hollow Site (Steege 1967)



CERAMIC SITES
IN SOUTHEASTERN WYOMING
SITES 32 - 35 APPROXIMATE LOCATIONS FROM GUNNERSON (1960)
SITES 36 - 44 APPROXIMATE LOCATIONS FROM RENAUD (1931)
S. DAK.
WYO
NEBR.
AREA SHOWN BELOW
COLO.
KAN.
0 100 200 MILES
W Y O
0 10 25 50 MILES
CONVERSE
NATRONA
NIOBRARA
PLATTE
ALBANY
GOSHEN
CARBON
LARAMIE
C O L O
NEBR.
S. DAK.
CASPER
LARAMIE
CHEYENNE
NORTH PLATTE RIVER
MEDICINE BOW R.
LITTLE LARAMIE R.
LARAMIE R.
LANCE CR.
NIOBRARA R.
HORSESHOE CR.
RAWHIDE CR.
LARAMIE R.
SYBILLE CR.
CHUGWATER CR.
BEAR CR.
LITTLE BEAR CR.
HORSE CR.
LITTLE HORSE
LODGEPOLE CR.
SPRING CR.
MUDDY CR.
CROW CR.
SAND CR.
FOX CR.
LA PRELE CR.

Such conclusions are not surprising in view of the evidence. It was known the Plains were largely unsuitable for Indian agriculture. Bison hunting without the horse seemed difficult if not impossible to these early observers. Added to this were ethnographies and records that indicated many tribes were relatively recent arrivals on the Plains.

Kroeber continued to assert in later publications that prolonged or complete adaptations to the western grasslands were impossible without the horse. Before this, utilization was only by temporary incursions from bordering areas where "wood, water, and shelter were more abundant, fauna and flora more variegated, a less specialized subsistence mechanism sufficient" (1939:78). Kroeber maintained this position as late as 1948 (:823) although developments in archaeology had by then shown it was erroneous.

In the forefront of the beginning of professional, systematic archaeology on the Plains was W. D. Strong's work in Nebraska during the 1930's. The long sequence of occupation discovered at the Signal Butte site was particularly important (Strong 1935:224-238).

The WPA and other programs during the 1930's provided opportunities for large scale excavations in many areas, including village sites in Nebraska and the Dakotas, and buffalo kills, caves, and camps in Montana and Wyoming. After World War II archaeology on the Plains was further expanded by salvage operations for large federal water-control programs. The Missouri River Basin Project was particularly important for the northern and central Plains (Cooper 1955; Roberts 1952) although this renaissence had little direct effect on the area under study here.

Continuing archaeology on the Plains has resulted in a vast body of carefully gathered data. The older concepts of Plains prehistory have been drastically revised by ethnologists as well as archaeologists (eg. Ewers 1955:336-38; Eggan 1952:39-40; Lowie 1955:63-86). Many gaps remain in chronological sequences from various regions, but they are being closed with solid facts; the story of prehistoric occupation of the Plains is measurably clearer.

With continuous occupation of the Plains established, a number of studies were concerned with determining what adaptations were ncessary to survive in this environment. A perceptive study by Wedel reexamined the distribution of water and other resources on the Plains. It was demonstrated that these resources were available at surprisingly frequent intervals if one knew where to look (1963:4). Wedel concluded:

> ...our ignorance of human prehistory in the High Plains and in the mountain front along their western margin probably indicates not the absence of man or his infrequent use of the land so much as it does the limited search to which these sections have been subjected, and tne fact that we are here dealing with the remains of people whose

material culture at all times was limited to the essentials of a subsistence economy based on hunting and gathering (1963:13).

Purposes of This Study

This study is the documentation of surveying and excavation of ceramic sites in southeastern Wyoming. Problems in the area are legion and it is recognized that this work represents only preliminary efforts. One of the main purposes was to provide a solid evaluation for use in future archaeology in the area. Although this study is primarily concerned with ceramic sites, numerous earlier sites were found and recorded.

The area under investigation has been considered as part of the Northwestern Plains and as part of the Central Plains, (Wedel 1961:23, 81,245) and there is evidence for both. The eastern portions are close to sites and areas definitely a part of the Central Plains. The western and northern portions are close to sites and localities of the Northwestern Plains. These regions are separated by distinctive environmental situations which are reflected in native cultural patterns (Lehmer and Caldwell 1966:512). However, they are not so distinct as to preclude areas of transistion of overlap, and southeastern Wyoming is considered by the writer to be such an area. It was thought that archaeology in the area might encounter unique problems or gain new insights into the problems from both regions of the Plains.

There are several reasons why this study is primarily concerned with ceramic sites. Pottery has long been recognized as a sensitive cultural indicator. Investigations in ceramic sites should therefore be one of the best aids to archaeology of the later periods in Wyoming.

For some time the Northwestern Plains, including Wyoming, were characterized by such terms as "scarcity of pottery", "largely potteryless", and "pottery-making of negligible importance" (Wedel 1961a:27,28; 1961b:242). These ideas are analogous to the once-prevalent ideas about Plains prehistory in general: they were reasonable at one time but must be revised in view of current evidence. Pottery is not as plentiful as in some areas, but it is nowhere as scarce as once believed. This study is intended to be part of the ongoing research which is redefining the form and extent of pottery traditions in Wyoming.

Southeastern Wyoming has actually been mentioned rather frequently in conjunction with its ceramic affiliations. Three reports give brief mention of specific sites and the materials from them (Renaud 1931:58-63; Mulloy 1958:193-195; Gunnerson 1960:236-237). Others (Wedel 1961:257; Wood 1969:104; Kraus 1970:109) mention only that ceramics are found there, usually without giving a source for this information. Obviously there is a need for archaeology of ceramic sites in this area.

Fortunately the area is not surrounded by such an archaeological vacuum. Another reason this area was chosen for study is because of its proximity to well-documented sites in western Nebraska and northeastern Colorado. Most of the ceramic sites in southeastern Wyoming appear to be closely related to these sites farther to the east. Until we understand the nature of this relationship we cannot make proper interpretations.

Although not as deficient as once thought, the High Plains environment must have placed very definite limitations on the prehistoric populations there. Studies in this area should therefore be particularly enlightening in terms of prehistoric human ecology. The writer has long felt that the key to understanding prehistoric utilization of the High Plains environment was to be found in the systems of wooded scarps and buttes which occur along parts of principal streams. This was because of the additional wood, water, shelter, and food resources found there. It was the distribution of precisely these resources which was being studied in the previously mentioned article by Wedel (1963).

The area chosen contains three such localities, along Lodgepole Creek at Pine Bluffs, along Horse Creek, and around the southern edge of Goshen Hole. Similar areas occur just a few miles north and south of the area, and the topographic features within the area continue for some distance into Nebraska. One of the main purposes of this study was to begin relating the environment and the archaeology of these "enclaves".

Field Methods and Procedures

This section is to present a brief description of techniques used in gathering the data presented in this report. Field work consisted basically of two parts–surveying and gathering of surface materials, and test excavations.

The surveying was concentrated in the wooded scarp and butte areas and in adjacent stream valleys. As much area as feasible was covered each day by foot and motorcycle. All sites were recorded in notebooks and later plotted on U.S.G.S. topographic maps. On the following day surveying started where it had ended the previous day.

In general surface sampling did not present a problem. Most sites were of a size and nature that all surface material was picked up. This material was sacked and designated by site and put aside for later description. This process was not feasible at three ceramic sites, but as complete as possible surface collections were made. Test excavations were later conducted at these three sites so it is felt that representative samples were probably gained from most sites. Each site was recorded on a site report form similar to that given in Heizer and Graham (1967:22) and these are on file at the Department of Anthropology, University of Wyoming.

In addition to this survey, numerous local collectors were contacted about ceramic sites and materials. When possible, these sites were visited and included in the surveyed locations. For others, only a description of the material and approximate location supplied by the collector is given (Chapter V).

This survey was considered to be an absolute necessity. For all practical purposes no record of sites in the area exists. Surveying was conducted on weekends and vacations during 1969 and the spring of 1970, and during August and September of 1970. Each site was revisited and surface-hunted and some additional surveying done during April, 1971.

Test excavations were conducted at five sites during August and September, 1970. One of these yielded no ceramics and will not be considered here. The crew at these sites ranged from the writer alone to nine people.

It was immediately recognized that time, money and available help would permit either testing of several sites or more extensive excavations at perhaps one site. In view of one of the purposes of this study - to gain an overview of ceramic types and distributions in southeastern Wyoming - it was decided to test several sites. Such data would integrate more readily with survey material, and might prove more valuable as indicators for future research.

At each site selected for testing a datum point was established, from which all measurements could be taken. A topographic map was made of each site, using plane table, rod, and alidade. A grid system of five feet by five feet or five by ten feet units was established along principal directions across each site. Methods for selecting units to be excavated varied from site to site and are explained in the section on each site in Chapter IV.

Initial test units were excavated in arbitrary six inch levels, using shovels, screens, trowels, and whisk brooms. Using this unit for control, other units were excavated by natural or cultural levels as much as possible. In practice, excavation usually proceeded by a combination of natural, cultural, and arbitrary levels.

All artifact and related material was recorded on graph paper by horizontal feet and inches to the datum, and vertically to the nearest possible inch below ground surface. This designation was also recorded on sacks containing the material.

All dirt from excavated units was screened through 1/4 inch or 1/8 inch mesh. All material recovered by screening was put in sacks and given its proper provenience.

Analysis of the Material

Each excavated site and the material from it is treated separately in Chapter IV. Surveyed sites with only surface material are described in Chapter V. Methods and procedures of analysis of these materials are brought out in these sections.

In general, the objectives of such analysis are to derive classifications to allow comparisons of cultural assemblages and to place these assemblages in relation to others in a space-time framework. As mentioned above ecological adaptations and adjustments are also important considerations in such analysis. Discussion of attributes, types, and so on will follow the general consensus reached among archaeologists on the Central and Northwestern Plains. The lack of standardization in such terminology is notable, but the writer will be as consistent as possible.

Previous Investigations in Southeastern Wyoming

Renaud's (Archaeological Survey of Eastern Wyoming (1931) provides the first useful reference known to the author for archaeology in southeastern Wyoming. Specific mention is made of a "campsite at the foot of the bluffs" at Seven Mile Point (1931:1). Ceramic material was found by the writer on top of Seven Mile Point, but only scattered lithic material has been found at the foot of the bluffs.

Several other ceramic sites are mentioned by Renaud. These are: W131-north of Lingle near Rawhide Creek, WX1-north of Lusk, W22-west of Chimney Rock in the Sand Creek District, WR65-south of Goshen Hole at the west end of Bear Mountain, a site at Battleship Hill seventeen miles north and one and one-half miles west of Torrington, W121-north of Lusk on Hat Creek, WR88-at Warm Springs on the North Platte River near Guernsey. A pottery vessel from Bald Butte in northern Goshen County is also described (1931:58-62). The approximate locations of these sites are shown in Fig. 1.

Mulloy (1958:193) notes the occurrence of pottery on a small butte near Meriden. This is believed to be the same butte found by the author and reported on at Gurney Peak Butte. Also mentioned are numerous sherds picked up by collectors in the vicinity of Cheyenne. Ceramic materials were also recovered from the Red Buttes Site in the southern Laramie Basin and from two campsites north of Laramie (1958:194). Ceramic material has also been excavated by Mulloy from the Willow Springs site in the southern Laramie Basin (personal communication). This material is described in Chapter V.

A previous survey by the author of sites in the vicinity of Pine Bluffs revealed four ceramic sites, including Seven Mile Point (Reher 1969:11-29).

Several sites were shown to the author by Mr. Grant Willson of Cheyenne, and two of these have recently been mentioned by him in the Wyoming Archaeologist (1971:23-41).

Gunnerson (1960:236-237) mentions three sites in southeastern Wyoming. These are : 48PL11, on the North Platte River, U:11:1, north of Lingle in Goshen County, and AA:6:1 in Albany County (Fig. 1).

Investigations in Neighboring Areas

It is pertinent in this introduction to mention investigations of ceramic sites in neighboring areas in Nebraska and Colorado. Gunnerson (1960:222) mentions a site, 25BN2, in Bull Canyon in extreme western Nebraska. A small site containing cord-marked pottery was found by the author in this same locality. Other sites from northeastern Colorado are described (1960:227-233).

The Bull Canyon locality is only about fifteen miles southwest of the important Signal Butte site dug by W. D. Strong (1935:225-239).

Farther east along the North Platte is Ash Hollow Cave (1946:1-57). Also found in western Nebraska are the rock shelters excavated by Bell and Cape in the 1930's (1936:357-399). The southeastern Wyoming sites, as mentioned above, are related to numerous other published ceramic sites in western Nebraska (eg. Kivett 1949, 1952; Strong 1935; Wood 1969; Wedel 1960; Gunnerson 1960; Hill and Metcalf 1942; Champe 1936).

Numerous ceramic sites have been reported from northeastern Colorado, usually as small articles in Southwestern Lore (see Dick 1953; Breternitz and Breternitz 1965). Several more lengthy reports deal with ceramic sites in the foothills and mountainous regions around Denver (Irwin and Irwin 1959; Irwin Williams and Irwin 1966). Three rock shelters were excavated in the Agate Bluff area just south of the Wyoming-Colorado border (Irwin and Irwin 1957). Another rock shelter in the same general area was excavated by the Cheyenne Chapter of the Wyoming Archaeological Society (Steege 1967).

The most comprehensive report of archaeology in northeastern Colorado is a dissertation by J. J. Wood (1967). This reports on the excavation of sixteen sites and on survey material from thirteen sites, many of which contained ceramics.

CHAPTER II

NATURAL SETTING

Southeastern Wyoming, as it is used here, is the area contained by an area drawn from the Medicine Bow Mountains around the north end of the Laramie Mountains and along the Hat Creek Breaks to Nebraska. At this time this is a division of convenience and should not be regarded as an archaeological district. Generalized topographic features are presented to provide a geographic setting for discussion of ceramic sites within this area.

The environment of the more restricted "study area" will be examined in more detail. This area can be roughly defined as southeastern Wyoming east of R.66W. and south of T.21N.

Southeastern Wyoming - Topography and Drainage

Just south of the Wyoming border the Colorado Front Range splits to form the Medicine Bow Range and the Laramie Range. The Medicine Bow Mountains consist of a series of glacially carved peaks up to 12,000 feet high which rise above large plateau-like erosion surfaces 9,000 to 11,000 high. The Laramie Range is a broad anticlinal structure with rounded granite peaks characterizing the southern part, and larger, more rugged peaks in the northern part. Elevations average between 8,000 and 9,000 feet, but reach over 10,200 feet at Laramie Peak. Both mountain ranges have a series of hogbacks along parts of either side (Fig. 2).

Other main topographic features in southeastern Wyoming include the Laramie Basin, which is a broad plain about ninety miles long and thirty miles wide between the Laramie and Medicine Bow mountains. Elevations on the basin floor average between 7,000 and 7,500 feet.

The Hartville Uplift is a small anticlinal feature northeast of the Laramie Range. It is approximately twenty miles wide and thirty miles long, and elevations within it can be over 6,000 feet. North of the Hartville Uplift are the Hat Creek Breaks, a western extension of the Pine Ridge escarpment. Pine Ridge usually marks the northern boundry of the High Plains physiographic section, and it is used here for similar purposes.

Goshen Hole is a pronounced widening of the North Platte River. It begins on the southeast end of the Hartville Uplift and extends into Nebraska, reaching a maximum width of about fifty miles. A well-developed scarp surrounds much of this feature. Elevations above the scarp usually run over 5,000 feet, and elevations in Goshen Hole are as much as 1,000 feet lower.

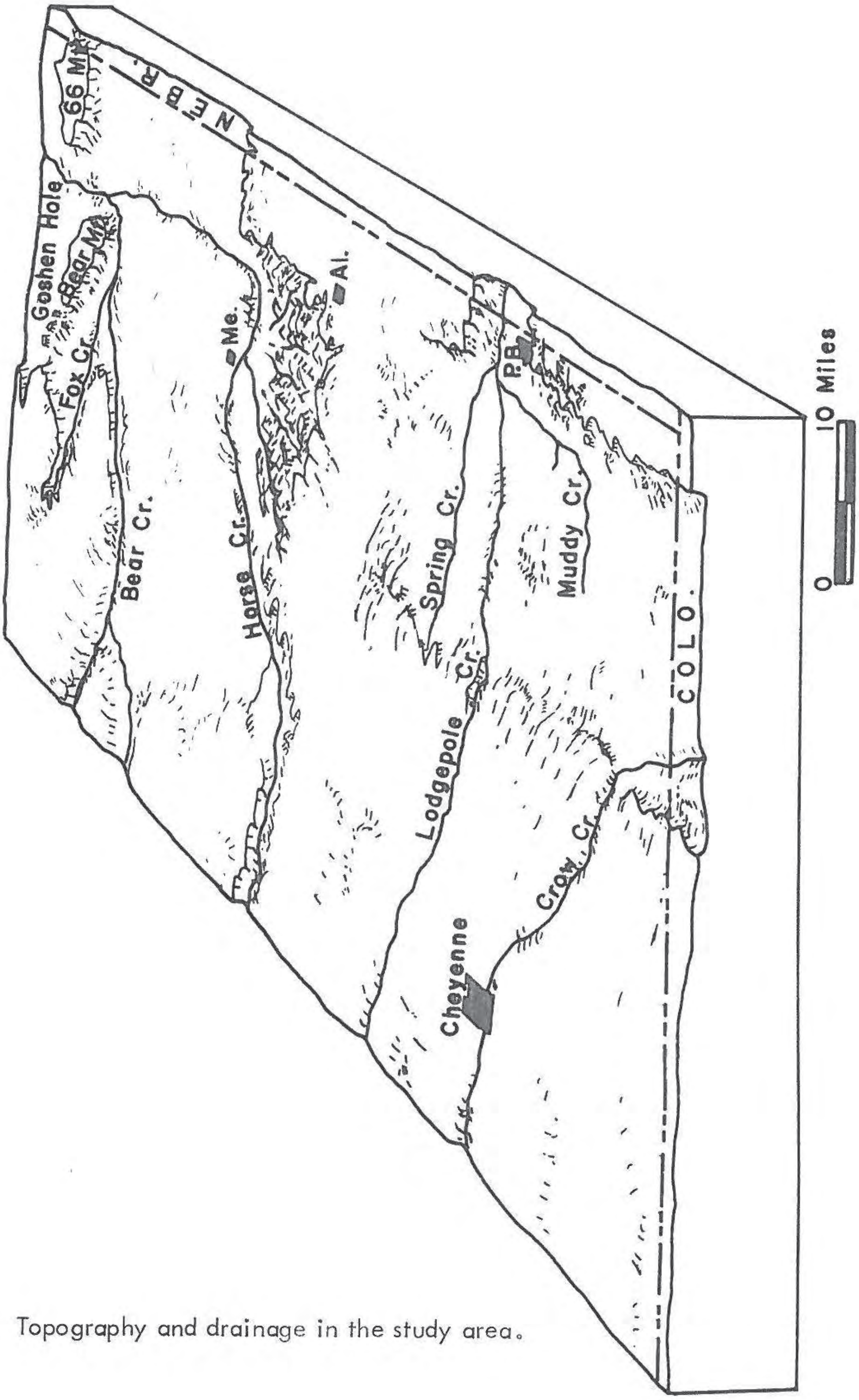


Figure 2. Topography and drainage in the study area.

The principle drainage system in southeastern Wyoming is that of the North Platte River. The North Platte heads on the west side of the Medicine Bow Mountains in the Colorado-Wyoming border area. After flowing along the Medicine Bows it turns northeast and cuts across the northern end of the Laramie Range. From here it turns southeast, flows across the south end of the Hartville Uplift, and through the Goshen Hole into Nebraska.

The Laramie River originates in the east side of the Medicine Bow Range, flows across the Laramie Basin and through the center of the Laramie Range, and joins the North Platte just above Goshen Hole (Fig. 2).

Much of the country east of the Laramie Range foothills consists of rolling, grassy uplands typical of the High Plains. These uplands are the remnant of a large Tertiary plain which once extended from the peaks of the Rocky Mountains to beyond the boundry of the present Great Plains. The Gangplank west of Cheyenne is the only area where these Tertiary sediments still extend up onto the mountains.

Several east-flowing streams have cut broad, often steep-aided valleys into this surface. Much of the area and drainage east of the Laramie Mountains is included in the study area and will be discussed below.

The Study Area

The area of most intensive investigation is divided into three localities on the basis of physiographic characteristics. These localities are also areas of relative site concentration and are separated by areas with few sites. It is believed these divisions correspond closely to the archaeological locality defined by Willey and Phillips:

> ...spatial unit, varying in size from a single site to a district of uncertain dimensions; it is generally not larger than the space that might be occupied by a single community or local group......In strict archaeological terms, the locality is a geographical space small enough to permit the working assumption of complete cultural homogeneity at any given time (1958:18).

The three localities defined here may possibly be combined into two or even one. However, the writer believes the data currently available does not permit this while still retaining the "assumption of complete cultural homogeneity."

Topography and Drainage

The Pine Bluffs Locality

The Pine Bluffs locality is in the extreme southeastern corner of Wyoming.

Its boundries can roughly be drawn along the Wyoming-Nebraska border on the east, the Wyoming-Colorado border on the south, the line between R.62W. and R.63W. on the west, and the line between T.16N. and T.17N. on the north.

The most prominent topographic feature in the area is the Pine Bluffs escarpment. This scarp runs from northern Colorado to about nine miles north of the town of Pine Bluffs. It faces west and rises abruptly to 200 or 300 feet above the adjacent lowlands (Fig. 3). A smaller, less sharply defined, east facing scarp occurs along parts of the west side of this locality. In most places this is only a steeper slope down to lower elevations.

The central part of this area, between the escarpments, is a gently undulating lowland some fifteen miles wide and twenty miles long.

Extending back from the two scarps are relatively flat, undissected uplands. Elevations vary from 5,500 feet on the western uplands to 5,000 feet where Lodgepole Creek enters Nebraska through a gap cut in the eastern scarp.

Lodgepole Creek is the principle stream in this locality. It heads in the Laramie Mountains northwest of Cheyenne and is perennial until it reaches the central lowlands, across which it is ephemeral. Lodgepole Creek reappears near Pine Bluffs, flows across Nebraska and enters the South Platte River at a point near Julesburg, Colorado. Lodgepole Creek enters Nebraska through a valley about three miles wide out through the Pine Bluffs escarpment. Gradually decreasing scarps extend eastward for two or three miles on either side of this valley.

Muddy Creek is a tributary of Lodgepole Creek which drains the southern portion of the central lowlands. It heads in these lowlands, and is intermittent along most of its length. Spring Creek heads in the western escarpment north of Lodgepole Creek. It is flowing in its upper few miles and is then intermittent or ephemeral until about three miles from its juncture with Lodgepole Creek.

<u>The Horse Creek Locality</u>

This locality begins in R.66W. and extends eastward along Horse Creek until the stream turns north; from here the area continues eastward into Nebraska. The width of the area on either side of Horse Creek varies, depending on the topography. As an archaeological locality this area might extend a short distance to the west, and for some distance into western Nebraska.

Along some parts of Horse Creek the stream valley is separated from the uplands by a broad belt of north-facing scarps and steep hills. These features are most prominent in an area from about R.64W. to the Nebraska border. About three miles from the border this escarpment system bends north for five miles, then back east into Nebraska. West of R.64W. the Horse Creek Valley is bordered by less extensive scarps.

Above this prominent scarp system the uplands continue unbroken into the Pine Bluffs locality, some twenty miles to the south. Relatively flat topography extends northward from the Horse Creek Valley to Bear Creek and the edge of Goshen Hole (Fig. 3).

Horse Creek heads in the Laramie Range about ten miles north of Lodgepole Creek. It has perennial flow along its entire length. From the mountains it flows east and northeast almost to Nebraska, where it turns north into Goshen Hole and joins the North Platte River.

Numerous small spring-fed streams originate in the Horse Creek escarpment, including Stinking Water Creek, Bushnell Creek, Kellehan Creek, Herrick Creek, Hill Creek, Bull Springs Creek, and Little Horse Creek. Little Horse Creek flows for about fifteen miles to join Horse Creek; the others usually flow out of the escarpment system and sink into the sandy valley fill along Horse Creek.

The Southern Goshen Hole Locality

This locality was subjected to the least intensive investigations and is probably less definitive for archaeological purposes. Geographically it consists of the area along Fox Creek and the margin of Goshen Hole, from about the head of Fox Creek until its juncture with Bear Creek.

As defined above this area includes the Fox Creek drainage, the tip of the continuous Goshen Hole Escarpment, and isolated remnants of this escarpment such as Castle Rocks and Bear Mountain. Castle Rocks are a series of small sandstone pinnacles in the gap between the scarp and larger, mesa-like Bear Mountain (Fig. 3). A wider and deeper gap occurs where Horse Creek flows between Bear Mountain and Sixty Six Mountain.

Fox Creek originates from springs in the uplands southwest of the main Goshen Hole escarpment. It parallels this escarpment in a steep, incised canyon for about twelve miles until it joins Bear Creek on the southern side of Bear Mountain.

Bear Creek heads in the plains west of this locality and has also incised a steep-sided canyon into the upland surface. This stream is intermittent for the first eighteen miles and flowing for the last thirty-seven miles. After being joined by Fox Creek, it flows east and north around Bear Mountain to join Horse Creek.

Climate

The climate in this area is one of extremes. It can fluctuate from relatively humid in some years to desert-like in others, but is best characterized as semi-arid. Seasonal precipitation patterns are typical for the High Plains - up to two-thirds of precipitation occurs in the spring and early summer. Precipitation usually levels off during the rest of the summer and decreases to a minimum during winter. Much

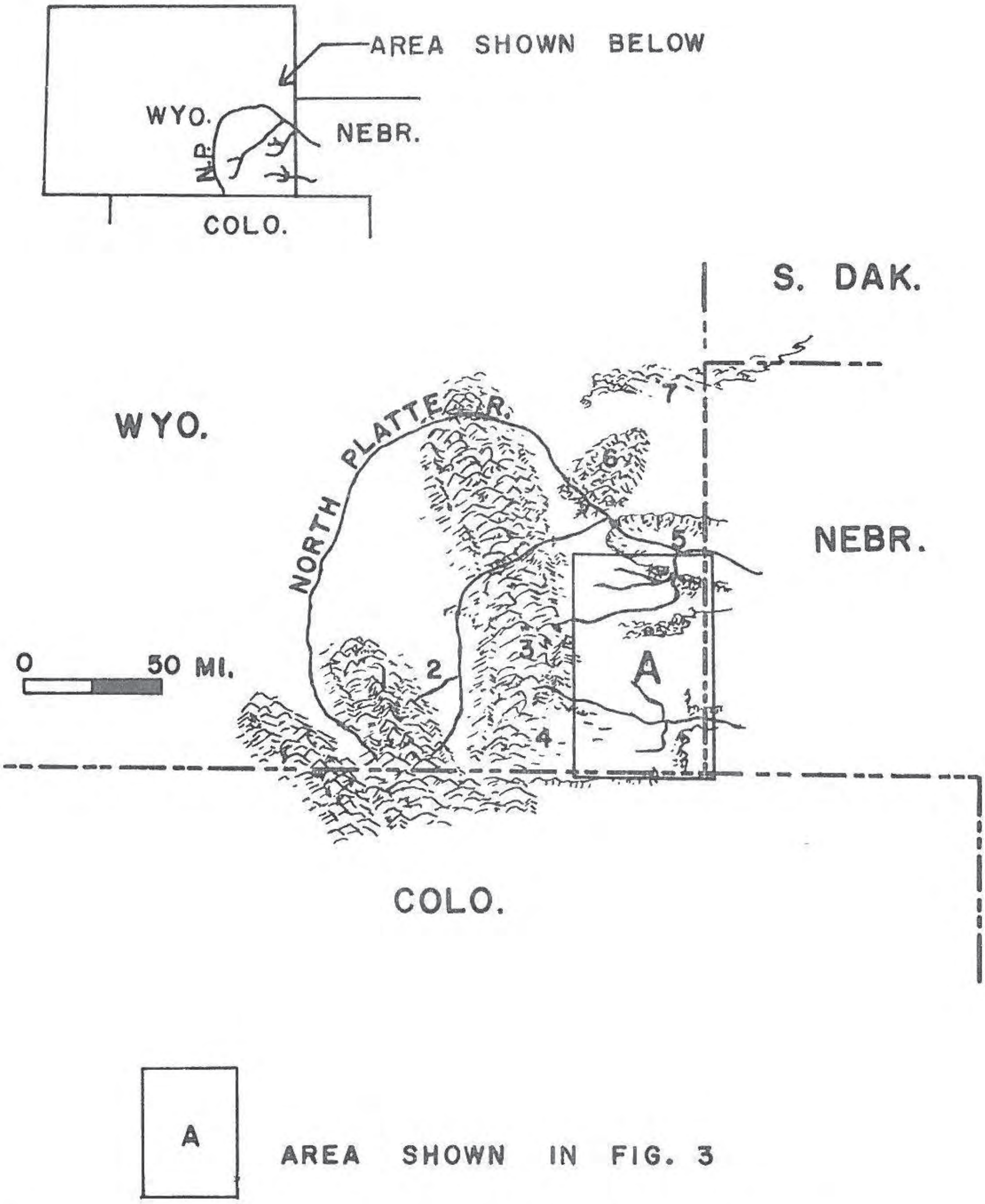


Figure 3. Topographic features in southeastern Wyoming.
1 - Medicine Bow Mountains
2 - Laramie Basin
3 - Laramie Mountains
4 - Gangplank
5 - Goshen Hole
6 - Hartville Uplift
7 - Hat Creek Breaks

water from heavy rainfall is lost by runoff and water from light showers is evaporated by the following bright sunshine and winds. The distribution of precipitation is erratic. Annual precipitation at Pine Bluffs, Albin, and LaGrange averages about sixteen inches.

Temperatures also reflect climatic extremes. Record temperatures from the three towns listed above range from -48° to 110°F. (Becker and Alyea 1964). Lowest temperatures usually occur during January and highest towards the end of July. Summer days are generally hot, but nights are cool, due to low humidity and air movements. There are usually fewer than five periods of extreme cold during winter, and these last only a few days.

Wind velocities are moderately high. The area east of the Laramie Range is benefited by the "downslope effect". Prevailing westerly winter winds must descend about 3,000 feet after crossing the mountains. Compressing and heating of the air results (about 5 1/2 F. for every 1,000 feet of descent). Chinook winds, a similar but more complex phenomenon, occasionaly occur (Becker and Alyea 1964:5). Hot and dry southerly winds of high velocity often parch the area during summer.

Flora

Vegetal cover over most of the area consists of various mid and short grass species. Most important among mid grasses are side-oats grama (Boutelcua curtipendula) and hairy grama (Bouteloua hirsuta), needle grass (Stipa spartea), western wheatgrass Agropyron smithii), dropseed (Sporobolus heterolepis), Junegrass (Koeleria cristata) and little bluesterm (Andropogon scoparius). Short grasses consist for the most part of buffalo grass (Buchloe dactyloides), blue grama (Bouteloua gracilis) and panic grasses (Panicum scribnerianum and wilcoxianum) (Weaver 1954:53-85, 1965:113-134).

Numerous forbs and shrubs also occur on the grasslands. Most common are yucca (Yucca sp.), prickly pear (Opuntia sp.), sage (Artemisia sp.) and slatbush (Atriplex sp.).

Box elder (Acar negunda), cottonwood (Populus occidentalis), and willows (Salix sp.) grow along water courses or where the water table is close to the surface.

The escarpment systems support a relatively thick growth of ponderosa pine (Pinus ponderosa) and juniper (Juniperus scopulorum). Small groups of limber pine Pinus flexilis) are found in the Pine Bluffs escarpment. Numerous shrubs are common in the escarpments, including rabbit brush (Chrysothamnus sp.) and skunk brush (Rhus trilobata) (Carey 1917:14-30). Well-watered and sheltered areas within the escarpment have thick growths of bushes, including hackberry (Caltis occidentalis), chokecherry (Prunus melanocarpa) and wild current (Ribes sp.). Large junipers in these areas are often covered with wild grape vines (Vitis vulpina).

Table I. Plant foods in Southeastern Wyoming

Plant		Edible parts
Ponderosa Pine	Pinus ponderosa	cambium layer sugar, seeds
Limber Pine	Pinus flexilis	seeds
Juniper	Juniperus scopulorum	fruit
Box Elder	Acer negundo	sugar from sap, inner bark
Wild Currant	Ribes sp.	fruit
Wild Grape	Vitis vulpine	fruit
Chokecheery	Prunus melanocarpa	fruit
Wild Plum	Prunus americana	fruit
Hackberry	Celtis occidentalis	fruit
Wolfberry	Symphoricarpos occidentalis	fruit
Buffaloberry	Lenargyrea sp.	fruit
Bulruch	Soirnis sp.	roots, pollen
Cattail	Typha latifelia	roots, shoots, seeds
Saltbush	Artiplex sp.	seeds
Yucca	Yucca sp.	stems, flowers, seeds, pods
Prickly Pear	Opuntia sp.	fruit, stems, seeds
Prairie Plum	Astragalus succulentus	fruit
Prairie Potato	Psoralea esculenta	tuber
Mildweed	Asclepaas speciosa	spring shoots
Sunflower	Helianthus sp.	seeds, tuber
Goosefoot	Chanopodium sp.	seeds, greens
Wild Onion	Allium sp.	bulb
Junegrass	Koaleria cristata	seeds
Wild Rye	Elynus sp.	seeds
Dropseed Grass	Sporobolus sp.	seeds

Fauna

Large portions of the study area are used today only as native pasture. As such they support a large and varied fauna; this is espcially true of the more remote parts of the scarp systems. Unless noted otherwise, the animals discussed below are still found in the area today. All of the forms listed can be considered as a food resource available to prehistoric occupants.

The large grasslands, sheltered canyons, and numerous small streams made this area into some of the best natural habitat for buffalo (Bison bison) on the Plains. Several herds are raised by ranchers in the area today. Other large grazers found occupying the area today are pronghorn antelope (Antilocapra americana) and mule deer (Odocoileus hemionus). Antelope are usually seen on the open grasslands and mule deer are confined more to the escarpments and their margins. Southeastern Wyoming was also once within the range of elk (Cervus canadensis) and Bighorn sheep (Ovis canadensis) (Long 1965:710-711, 720-721). An occasional small group of elk is reported from the Pine Bluffs escarpment in northern Colorado, apparently having worked their way across from the mountains.

Carnivors in the area include small predators such as coyote (Canis latrans), red fox (Vulpes vulpes), bobcat (Lynx rufus), racoon (Procyon lotor), weasel (Mustela frenata), mink (Mustela vison), badger (Taxidea taxus), skunk (Mephitis mephitis), and black-footed ferret (Mustela nigripis). Carnivors which were found in the area in the past are the gray wolf (Canis lupus), mountain lion (Felis concolor), and grizzly bear (Ursus arctos).

Common smaller mammals include white-tailed jack rabbit (Lepus townsendii) and black-tailed jack rabbit (Lepus californicus), cottontail (Sylvilagus sp.), ground squirrels (Spermophilus sp.), black-tailed prairie dog (Cynomys ludovicianus), pocket gopher (Geomys bursarius), muskrat (Ondatra zibethicus), and porcupine (Erethizon dorsaturn). Beaver (Castor canadensis) were found along the Horse Creek and Lodgepole Creek until the advent of fur trappers, and they occur in the headwaters today (Carey 1917, Long 1965).

Certain large birds might have been important as a source of food. Among these are sage hen (Centrocercus urophasiansus) and waterfowl such as teal (Querquedula sp.) and mallard (Anas platyrnchos). Other large birds in the area are predators such as eagles, hawks, and owls. Most numerous among smaller birds in the area are meadowlark (Sturnella neglecta), kingbird (Tyrannus sp.) and mourning dove (Zenaidura macroura). All of the species listed above which are present in the area today were observed by the writer during field investigations.

Reptiles and amphibians common in the area include rattlesnake (Crotalus confluentus), garter snake (Thamnophis sp.), bull snake (Pituophis savi), various lizards (Holbrookia, Uta, and Sceloporus sp.), frogs (Rana sp.), and salamanders (Ambystoma tigrinum) (Carey 1917). Rattlesnakes are the most common reptile, especially in the Horse Creek locality where they were seen on the average of one or two per day during several weeks spent there.

Fish in the principal streams consist mainly of suckers (Catostomus sp.) and chubs (Semotilus sp. and Hybobsis sp.). Brook trout occur (Salvelinus fontinalis) in the upper parts of Lodgepole Creek, Horse Creek, and Spring Creek, but these are an introduced species.

CHAPTER III

GEOLOGY

The relationship between archaeology and geology is especially close because most sites have problems involving geomorphology. Geologic interpretation is often vital in understanding the site. On the other hand, archaeological data can be invaluable for geologic investigations.

Establishment of chronological sequences and reconstruction of past environments are just two areas where these fields commonly overlap. Archaeologists and geologists have often collaborated on specific sites or problems, but the writer has long felt that such cooperation should be normal operating procedure. Before this can come about, professionals from each field must become knowledgeable in at least the basics of the other field.

A complete discussion of the geology of the area under consideration is beyond the scope of this study, but a summary will be given in this chapter. Whenever possible the geology will be related to the archaeology of the area. For practical purposes, certain aspects of the geology will be discussed in terms of the three localities proposed in Chapter II.

Previous Investigations

O. E. Meinser (1917) conducted a brief investigation of the Lodgepole Creek Valley in Wyoming and Nebraska in 1915. Knight and Morgan (1936) reported on geology and ground water in the Pine Bluffs-Egbert area, and a similar paper was issued in 1938 (Burleigh, Gwillim, Dunnewald and Pearson). Lugn included a small part of southeastern Wyoming when he mapped the Tertiary of Nebraska (1939). A preliminary report on geology and ground water economics was written by Morgan, Graham, and Foley (1943). The Tertiary stratigraphy was described in detail in a thesis by J. W. Minick (1951). A U.S.G.S. Water Supply Paper, based on the 1943 report and on additional fieldwork was issued in 1953 (Rapp, Warner, and Morgan). The last two publications are the most useful and the most comprehensive for the Pine Bluffs locality.

A study of the geology and ground water resources of the Patrick and Goshen Hole quadrangles by Adams (1902) included the Southern Goshen Hole locality and part of the Horse Creek locality. The geology and water resources of the Horse Creek Valley and Bear Creek Valley were studied in a thesis by Dockery (1939). The same data was later issued as a Bulletin of the Geological Survey of Wyoming (Dockery 1940).

Stratigraphy

Outcrops in the area range from Tertiary to Recent, and Cretaceous rocks are exposed in Goshen Hole just north of the area under study. The Tertiary beds are essentially flat-lying, as is reflected by the gently rolling uplands. Tertiary units in the area usually strike north-south and dip to the east at a maximum of four degrees (Minick 1951:3; Dockery 1940:10). A generalized section is given (Table II).

Table II. Generalized geologic section for the study area (from Rapp, Warner, and Morgan, 1953).

System	Series	Formation	Physical character	Thickness (feet)
Quaternary.	Recent	Alluvium	Coarse sand and gravel containing beds and lenses of silt and clay.	0-85
		Unconformity		
	Pleistocene	Younger terrace deposits.	Sand and gravel containing a few thin beds of silt and clay.	10-60
		Unconformity		
		Older terrace deposits.	Sand and gravel containing a few thin beds of silt and clay.	30-150
		Unconformity		
Tertiary.	Pliocene	Ogalla formation.	Beds of clay, silt, sand, sandstone, gravel, and algal limestone containing flint, chalcedony, and agate.	0-70
		Unconformity		
	Miocene	Arikaree sandstone.	Massive to poorly bedded fine-grained loose to moderately cemented sand containing layers of well-cemented sandstone.	0-80
		Unconformity		
	Oligocene	Brule formation.	Massive fissured bentonitic siltstone that locally may be sandy or argillaceous. Contains joints and fissures and reworked cones of Brule pebbles.	±300

The basal unit throughout the study area is the Oligocene Brule Formation. The Brule Formation is exposed in the lowlands and on the slope of scarp systems. It is a fine-grained, pinkish to cream-colored clay derived largely from volcanic ash. It is a massive, thick-bedded formation with only faintly discernable bedding. The upper part of the formation often contains a system of joints and fractures. The Brule Formation averages about 200 feet thick in this area, but can be as much as 400 feet thick (Adams 1902:16; Dockery 1940:7; Minick 1951:11-14; Rapp, Warner and Morgan 1953:40-42).

In the Horse Creek and Southern Goshen Hole localities, the Brule is usually unconformably overlain by the Miocene Arikaree Formation. This formation is only about ten feet thick in the northern part of the Pine Bluffs locality, and is missing from the scarps south of Lodgepole Creek. The Arikaree consists for the most part of fine gray sandstone, but has several varying textural phases. These include conglomeratic beds, coarse cross-bedded sandstones, long, irregular, cylindrical caleareous sandstone masses, and occasional layers of more resistent concretionary sandstone (Adams 1902:17-18; Dockery 1940:7-8; Minick 1951:14-17; Rapp, Warner and Morgan 1953:42-43).

The Pliocene Ogallala formation overlies the Miocene deposits on the uplands above Horse Creek and on the northern Pine Bluffs escarpment. The Ogallala rests unconformably on the Brule in the southern Pine Bluffs escarpment. It is the uppermost unit in these localities. In the Southern Goshen Hole locality it is absent and the highest units consist of Arikaree sandstones. The Ogallala is made up chiefly of poorly sorted clay, sand, gravels and conglomeratic debris cemented by considerable calcareous material (Adams 1902:18-19; Minick 1951:18-24; Rapp, Warner, and Morgan 1953:43-44).

Quaternary material covers much of the lowlands and some of the uplands. These sands, gravels, silts, and clays occur as broad, sheet-like alluvial deposits and as terrace deposits along streams.

Geologic History

Repeated uplift and climatic change resulted in erosion in the mountains and recurrent deposition by streams during Oligocene times. The tuffaceous nature of the Brule indicates that volcanism was extensive in some distant area. The Brule's uniformity and lack of coarse components indicates deposition over an area of low relief (Rapp, Warner, and Morgan 1953:79-80).

The fine-grained Arikaree sandstone was apparently laid down by streams during a relatively quiet period following the Oligocene. Minick states that renewed uplift in late Oligocene time was a factor in the deposition of Miocene sediments (1951:25). Moore (1959:80-81) notes that most Miocene sediments were deposited farther east since Oligocene sediments had filled topographic lows nearer the Laramie

Range. The Arikaree contains sporadic beds of wind-blown volcanic ash (Rapp, Warner, and Morgan 1953:11) and Knight and Morgan saw fine wind-deposited sands in exposures of the Arikaree near Egbert (1936:2).

More active erosion in the mountains followed Miocene times, resulting in deposition of the coarser deposits of the Ogallala. Moore sees a dry climate with periods of intense precipitation "which produced flooding of short flow and duration" (1959:82). Toward the end of the Pliocene a Tertiary surface extended across the Laramie Range and well to the east across the Great Plains.

The Quarternary history of the area consisted chiefly of erosion of the Tertiary surface. The Gangplank west of Cheyenne represents the only area where Tertiary sediments still extend up onto the mountains. Streams in the area were rejuvenated by uplift at the end of Tertiary times, affected by climatic changes and enlarged by increased precipitation during the Pleistocene (Rapp 1953:11). The Tertiary deposits were deeply eroded, and present-day uplands above the scarps are only remnants of the once continuous Pliocene surface. Widespread cutting and filling led to deposition of broad sheets of sand and gravel. The principal streams also cut and built terraces, and in recent times deposited the modern alluvium of their flood plains.

Geomorphology

The study area is located in the High Plains section of the Great Plains province. The following section discusses certain geomorphic problems which the writer has observed while conducting archaeological investigations in the area.

Escarpments

Several extensive scarp systems in the study area result from erosion of the Tertiary mantle by the principal streams. These escarpments take somewhat different forms in the three localities.

At Pine Bluffs the scarp rises abruptly to 200 or 300 feet above the adjacent lowlands. Flat, relatively undissected upland usually begins within a few thousand feet of the scarp edge (Fig. 3).

Along Horse Creek there are areas resembling the Pine Bluffs escarpment, however, uplands are often separated from the stream valley by as much as four miles of rough, hilly country. Less continuous scarp features occur within this irregular topography (Fig. 3).

The southern margin of Goshen Hole is characterized by a divide topped by large mesa-like remnants such as Bear Mountain and Sixty Six Mountain. Lower gaps between these mesas may contain smaller butte or pinnacle features, such as at Castle Rocks (Fig. 3). Differences in these scarp systems are assignable to bedrock and drainage characteristics. The Pine Bluffs escarpment is representative of scarp problems on the Plains in general. It is apparently developed on upper, more resistant calcareous beds in the Ogallala. Distinctive algal limestone occur in the Ogallala at various places (Moore 1959:46-53). Rapp (et al 1953:43) notes that an algal limestone makes up the highest unit of the southern Pine Bluffs escarpment. However, the thinness of this unit (six inches to two feet) seems to rule out any major significance in scarp formation.

The Pliocene Ogallala at Pine Bluffs disconformably overlies the Oligocene Brule. Once the Brule is exposed by retreat of the Ogallala, it is rapidly eroded. This results in the steep initial slope below the scarp, and the lack of broad areas of irregular topography.

The escarpment system along Horse Creek is also developed on resistant calcareous beds in the Ogallala. Here, however, this formation overlies the Miocene Arikaree. This formation is more resistant than the Brule, and results in the persistance of steep-sloped and bench topography after the Ogallala caprock has been removed. This escarpment system, unlike Pine Bluffs, contains numerous flowing springs and streams, which undoubtedly contribute to the expression of the topography.

Scarp systems similar to those at Pine Bluffs and Horse Creek occur along parts of the Goshen Hole. Along the southern margin the Ogallala has apparently been absent for some time. Drainage systems have removed almost all of the scarp system which was probably once there. It has been subjected to erosion from the north by slope retreat and tributaries of the North Platte River, and from the south by tributaries of Horse Creek. This has left the narrow divide capped by the Miocene remnants mentioned above.

As mentioned in the introductory chapter, all of these topographic irregularities were important to prehistoric occupations because of additional resources of food, water, wood and shelter found there.

Isolated Buttes

In addition to the features mentioned for southern Goshen Hole, numerous small isolated buttes occur along Horse Creek. The Pine Bluffs scarp system, however, contains only one such feature. The questions to be asked are: why do these features occur frequently in two localities but not in the third, and, what caused the one isolated butte which does occur at Pine Bluffs?

The answer to the first question appears simply to be related to the presence or absence of the Arikaree formation. As Adams noted (1902:17), this formation and especially the upper homogeneous sandstones tend to weather into vertical walls, ledges, and pinnacles. The absence of this formation or any thick units of it at Pine Bluffs, as well as the presence of the easily-eroded underlying Brule, apparently precluded formation of isolated remnants there. In general, slope retreat progresses along a broad front as the Brule is eroded, and large slabs of the Ogallala are undermined (Fig. 4).

Figure 4a. Geomorphic Feature - The Pine Bluffs escarpment showing Pliocene Ogallala caprock, steep initial slope underlain by Oligocene Brule formation, large fragments of broken-off Ogallala

Figure 4b. Geomorphic Feature - The gap in the Ogallala between Pine Bluffs escarpment (to left) and Seven Mile Point (to right), and badlands erosional formation in underlying Brule (center).

What then caused the one isolated remnant found along the thirty miles of scarp at Pine Bluffs? The feature referred to, known locally as Seven Mile Point, is located in the NE1/4, NW1/4 of section seventeen, T.13N., R.60W. The flat top of this butte is over 550 feet long and 120 feet wide, and it is about 200 feet high.

Canyons extend back into the escarpment leaving points or fingers extended out towards the lowland. These do not retain a protective caprock long enough to become isolated. The scarp also is scalloped by broad, embayment-like features.

The projection of which Seven Mile Point was once a part is one of the longer projections along the scarp, and is flanked by a large embayment on the south. Because of this fortuitous location, the tip of this extension was subject to maximum erosion or scarp retreat from two directions instead of one. This alone would not be enough, but apparently headward erosion from two canyons, one from the west and one the south and southeast, met and resulted in a breach in the caprock. Once this happened, erosion would have been more rapid on the underlying Brule, than where the protective caprock still existed. This can be seen in the miniature badland which has developed today between Seven Mile Point and the main escarpment (Fig. 4).

This badland is relatively fossilferous. The only readily identifiable fossil found by the writer is an Oreodont calcaneum tentatively identified as Family Merycoidodontidae (McGrew, personal communication, 1971).

It is difficult to explain why topographic features were larger than usual at this location. It is probably significant that Muddy Creek flows in from the west and turns north only a few hundred yards from Seven Mile Point. The stream may also have had a role in the isolation of the butte. Many of these buttes or bench features had rather extensive prehistoric occupation on their tops. This subject is discussed more fully in a later chapter.

Closed Depressions

Several hundred closed depressions appear on topographic maps of the study area. These are various sizes, but can be as much as one and one-half miles long and over thirty feet deep. All of the problems inherent in the origins of these depressions on the Great Plains are associated with the depressions here. Most have their long axis oriented northwest to southeast and would thus appear to be deflation hollows. This could account for the origin of many of these features, especially along Horse Creek and southern Goshen Hole where there are large sandy areas. However, above Horse Creek on the Ogallala and around Pine Bluffs other factors seem to be involved.

These controlling factors appear to be related to drainage and bedrock as well as wind action. Depressions are usually close to scarp edges on the Ogallala-underlain uplands, and close to stream courses in the Brule-underlain lowlands. Large upland areas away from the scarps or large areas farther away from streams, and uplands underlain directly by Arikaree sandstones have no depressions.

It is concluded that (a) many of the closed depressions are in sandy areas and are simple deflation hollows, (b) other depressions in the Ogallala or Brule formations are the result of leaching of calcareous material or of piping which involved swelling and easily disaggregated clays, (c) these occur near scarp edges or drainages where downward and outward movement of water is possible, (d) deflation also aids in forming these depressions.

Terrace Sequences

To the writers knowledge no detailed study of the terrace sequence in this area has been undertaken. A system of up to three terrraces is found along many of the principal streams in the area. For example, three terraces occur along Lodgepole Creek in Section twelve, T.14N., R59W. at heights of about two, ten, and forty feet above the stream. Above these, large terrace-like deposits slope back to the escarpment. This sequence appears very similar to that defined for other parts of Wyoming by Leopold and Miller (1954). However, not enough work has been done at this point to permit such correlations. Although admitting no fossils have been found, Rapp suggests extensive "younger" and "older" Pleistocene terrace deposits in the Pine Bluffs area (et al 1953:44-45).

Related to the terrace system is a sequence of cutting and filling along tributary arroyos and streams. Numerous archaeological sites are exposed in these cuts, especially along intermittent tributaries in the Horse Creek escarpments. This is definitely one area where the archaeologist and the geomorphologist can assist each other.

Occurrence and Sources of Ground Water

Drainage patterns have been discussed previously (Chapter II). Geologic considerations of ground water are included here to provide a basis for later discussion involving sources of water for prehistoric human use.

Most water from underground sources in the Pine Bluffs area is derived from the Brule formation. The Brule is primarily a siltstone and generally low permeability is to be expected. However, the permeability is increased locally by porous zones of reworked material and especially by systems of joints and fissures. This zone of jointed and broken rock averages sixty to eighty feet deep. Some beds are more brittle and more susceptible to jointing than others. In some parts of the area this results in alternating water-bearing beds and massive impervious beds. Where this prevails water is sometimes encountered under hydrostatic pressure and will rise in the well or flow as an artesian well (Knight and Morgan 1936:3; Rapp, Warner, and Morgan 1953:41-42).

Ground water in sufficient quantity for stock and domestic use has been obtained from both the Arikaree and the Ogallala formations, but these are usually too impermeable to yield water sufficient for irrigation.

Terrace deposits and alluvium in the Lodgepole Creek Valley are sometimes saturated enough to yield usable quantities of water. More often, however, they are dry and water is found in the fractured Brule directly beneath them. The actual water table is often in the gravels, usually at depths of less than forty feet.

Most recharge of ground water in the Pine Bluffs area comes from three sources: subsurface inflow from the west, seepage from streams from the west, and precipitation within the area (Rapp, Warner, and Morgan 1953:19).

Intensive precipitation in the late spring produces the principle recharge. Seepage from streams is also important. All three streams entering the area disappear shortly after they flow out onto the Brule, between Carpenter, Egbert and Pine Bluffs. No springs or seeps are found in the escarpment itself. Precipitation on the uplands apparently moves down into the Brule and remains subsurface.

Underground water in the Horse Creek locality is obtained from the Oligocene Chadron, and much is also obtained from localized joint systems in the Brule. Water is also obtained from the Brule-Arikaree contact where the Brule is impervious.

Various units in the Arikaree, especially lower conglomeratic beds and permeable sandstones yield water sufficient for domestic or stock use, but usually not sufficient for irrigation. Local impervious layers sometimes cause perched water tables or slight hydrostatic pressure.

Gravel beds within the alluvium are an important source of ground water along lower Horse Creek. Water is gained from adjacent uplands and from Horse Creek, which is influent in places and adds to the water table. This situation also occurs, though less frequently, along Bear Creek (Dockery 1940:18-21).

In contrast to the Pine Bluffs locality, numerous springs occur in the Horse Creek escarpment system. These are usually contact springs, issuing from between the Arikaree and Brule formations. Water from several such springs usually combines to form small streams which flow out into the Horse Creek Valley where they sink into sandy alluvial or eolian material.

In addition to influent stretches on the streams, ground water is obtained from subsurface inflow. Precipitation is again the major source of recharge.

The situation along the southern Goshen Hole locality (Adams 1902:25-31) is much the same as that described for the Horse Creek. The less extensive scarp system is reflected by fewer springs and intermittent streams.

Stream Capture

An interesting example of stream capture is demonstrated where Horse Creek and Bear Creek bend sharply northward between Bear Mountain and Sixty Six Mountain. Sixty Six Mountain, Signal Butte, the Wildcat Ridge and other remnants form the north side of a valley where Horse Creek once flowed to join the North Platte River some forty-five miles farther east into Nebraska.

This fact was originally recognized by Adams. Darton had through this valley represented a former course of the North Platte (Adams 1902:25). This valley is now occupied by an underfit stream, Pumpkin Creek. Horse Creek was apparently diverted during a relatively late phase in the excavation and expansion of Goshen Hole. Traces of its former course can be observed between its bend northward and the head of intermittent Pumpkin Creek to the east.

Areas of Active Sand

Much of the covering material along Horse Creek and the southern Goshen Hole consists of sand derived from the Arikaree formation. Movements of livestock in some places have destroyed vegetation and resulted in deflated areas. Several areas contain active sand dunes, some of which are quite large (Fig. 4).

The deflated areas are interesting archaeologically because of the sites or artifacts which are exposed. Such contexts cause mixing of material, but diagnostic artifacts and pottery can be useful.

Figure 4c. Geomorphic Feature - Large area of active sand in Horse Creek locality.

CHAPTER IV

EXCAVATED SITES

Test excavations were conducted at five sites during this survey, two in the Pine Bluffs locality and three in the Horse Creek locality. One of the Pine Bluffs sites yielded little cultural material and no ceramics, and will not be reported on in this study.

A description of the location and nature of each site is followed by a discussion of the excavation procedures, stratigraphy, and features. Most of each site report will consist of documentation of excavated and surface materials. A final section will discuss certain aspects of the archaeological evidence, though most interpretation will be confined to Chapter VII, after all sites have been described.

Artifacts are classified in types, which are standard functional artifact categories in general use by archaeologists. The writer is in agreement with Krierger that a type cannot be "just any sort of grouping that the analyst wants to make for convenience in description or orderly presentation" (1949:70). Artifact types will sometimes be subdivided on the basis of observably similar attributes (eg. notched and unnotched projectile points).

The Horse Creek Locality

The Gurney Peak Bench Site, 48 LA 302

This site is located in section 31, R.61.W., T.18.N. and is an open campsite on a bench-like projection extending northwest from the front of the Horse Creek scarp system. This projection rises about eighty feet over the adjacent valleys in a series of tiers or step features. It is bordered on each side by vertical walls up to twenty feet high, and on the back by a forty foot scarp. Access to the site is by several climbable slopes or ledges, but elsewhere the projection is unclimbable (Fig. 5). The actual site area is a flat, triangular shaped area 130 feet wide and 110 feet long (Fig. 6).

Vegetation on the site consists of a few junipers, yucca, prickly pear, rabbit brush, and short grasses. Thicker growths of juniper and ponderosa pine start on the back of the site. A small spring-fed stream flowing along the west side of the projection has growths of juniper, willow, box elder, cottonwood, and an occasional chokecherry tree.

Excavation, Stratigraphy, and Features

The existance of this site was evidenced by scattered lithic and ceramic

Figure 5a. Gurney Peak Bench Site - looking southeast to bench-like feature on which site is located.

Figure 5b. Gurney Peak Bench Site - looking northwest across site area (center of photograph.

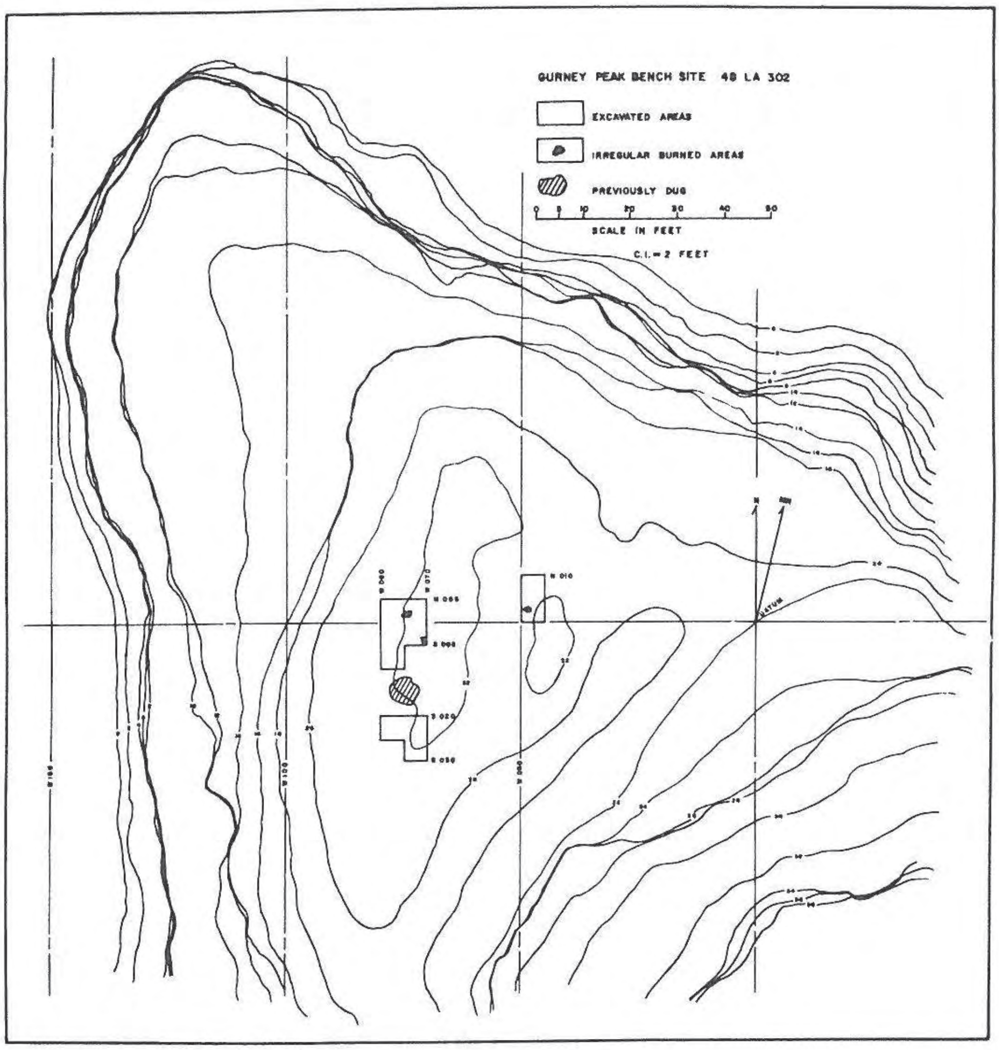


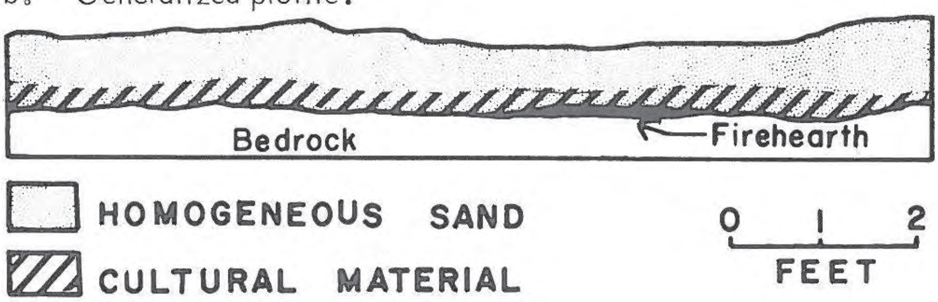
Figure 6. Map of the Gurney Peak Bench Site

a

Figure 7a. Excavated unit at Gurney Peak Bench Site.

b

Figure 7b. Generalized profile.



material occurring around the deflated edges of the site area. A few flakes were also found in the back dirt of an old depression on the western edge of the site (Fig. 6). Fortunately, the site did not yield enough to coax a real effort from the looters who dug in it.

A datum point was established on the southeast edge of the site and a test unit was placed approximately in the center of the site. This unit was excavated by arbitrary six inch levels using shovels, trowels, and whisk brooms, and running all dirt through 1/4 and 1/8 inch screens.

Bedrock was reached at an average depth of only ten inches. Stratigraphy consisted of two zones, an upper sod level four inches deep and a homogeneous brown sand extending to bedrock. Cultural material was mostly concentrated in the bottom three inches but scattered small items occurred almost up to the sod. No distinct or continuous cultural level was encountered. (Fig. 7).

Excavation of another unit farther to the west recovered much more cultural material, and later excavations were confined to this part of the site. The first six inches of dirt in these units were shoveled into 1/4 inch and 1/8 inch screens. The final four to six inches were removed more carefully with trowels and whisk brooms, and also run through screens.

Stratigraphy in these units was the same as in the initial test, with minor variations in depth due to surface irregularities. The only features encountered at this site were three thin areas of charcoal-smudged sand above areas of fire-blackened bedrock.

Excavated and Surface Materials

Chipped Stone

Projectile points: Eight complete or nearly complete projectile points, three classifiable fragments, and five unclassifiable fragments were recovered from excavations. Surface finds included one classifiable and two unclassifiable fragments. All are bifacially chipped, although on two specimens a large part of one side is made up of the original flake surface. Material used includes quartzite, jasper, local and non-local chert, agate, and quartz crystal. Chert occurring locally in the Tertiary units is gray to white and of poor quality while the non-local variety is brown or red and of much better quality. Agates, running from white to gray to purplish, also occur locally. Jasper as it is used here, includes glassy, usually transparent materials with black mottling, in shades of yellow, brown, red, and green.

Classifiable points are of two kinds, side-notched and unnotched (Table III). Bases of both kinds are straight or slightly concave. Outline is basically triangular. Blade edges are straight or slightly convex (Fig. 8 a-b).

Table III. Projectile Points

Description	% Complete	Length (mm.)	Width (mm.)	Thickness (mm.)	Notch Width (mm.)	Weight (grams)	Fig.	Material
Excavated								
1. side-notched	100	19	13	2	7	0.6	8g	jasper
2. side-notched	100	18	13	3	7	0.6	8f	jasper
3. side-notched	100	15	11	2	5	0.5	8h	quartz crystal
4. side-notched	20	-	11	3	5	0.2		jasper
5. unnotched	100	23	15	3	-	1.2	8a	jasper
6. unnotched	90	20*	13	3	-	0.8	8c	jasper
7. unnotched	80	19*	13	2	-	0.7	8b	jasper
8. unnotched	100	14	10	3	-	0.5	8e	quartzite
9. unnotched	90	20*	13	2	-	0.6	8d	
10. unnotched	70	-	-	3	-	0.8		non-local chert
11. unnotched	25	-	-	-	-	0.6		jasper
12. unclassifiable	10	-	-	-	-	-		jasper, chert
fragment (5)	25	-	-	-	-	-		(2), quartzite
Surface								
13. side-notched	20	-	12	2	6	0.4		quartzite
14. unclassifiable	20	-	-	-	-	-		jasper,
fragment (2)	50	-	-	-	-	-		quartzite

Bifaces: Eight fragments of bifaces were recovered, all from different tools. Seven of these represent one end of a biface, and two are mid sections. One biface base was also found on the surface. All are lenticular in cross-section. Several different shapes appear to be represented. Three come from tools with rounded tips and symmetrical blade edges (Fig. 8i, j, k) while another is pointed with blade edges symmetrical (Fig. 8o). Two have flat bases, rounded corners, and convex to straight sides (Fig. 8m). Another has a flat base, angular corners, and appears to have notches near the base (Fig. 8n). One mid section is too fragmentary to classify; the other is from a tool with straight, converging blade edges (Fig. 8l).

All bifaces were formed by an apparent soft hammer technique with some

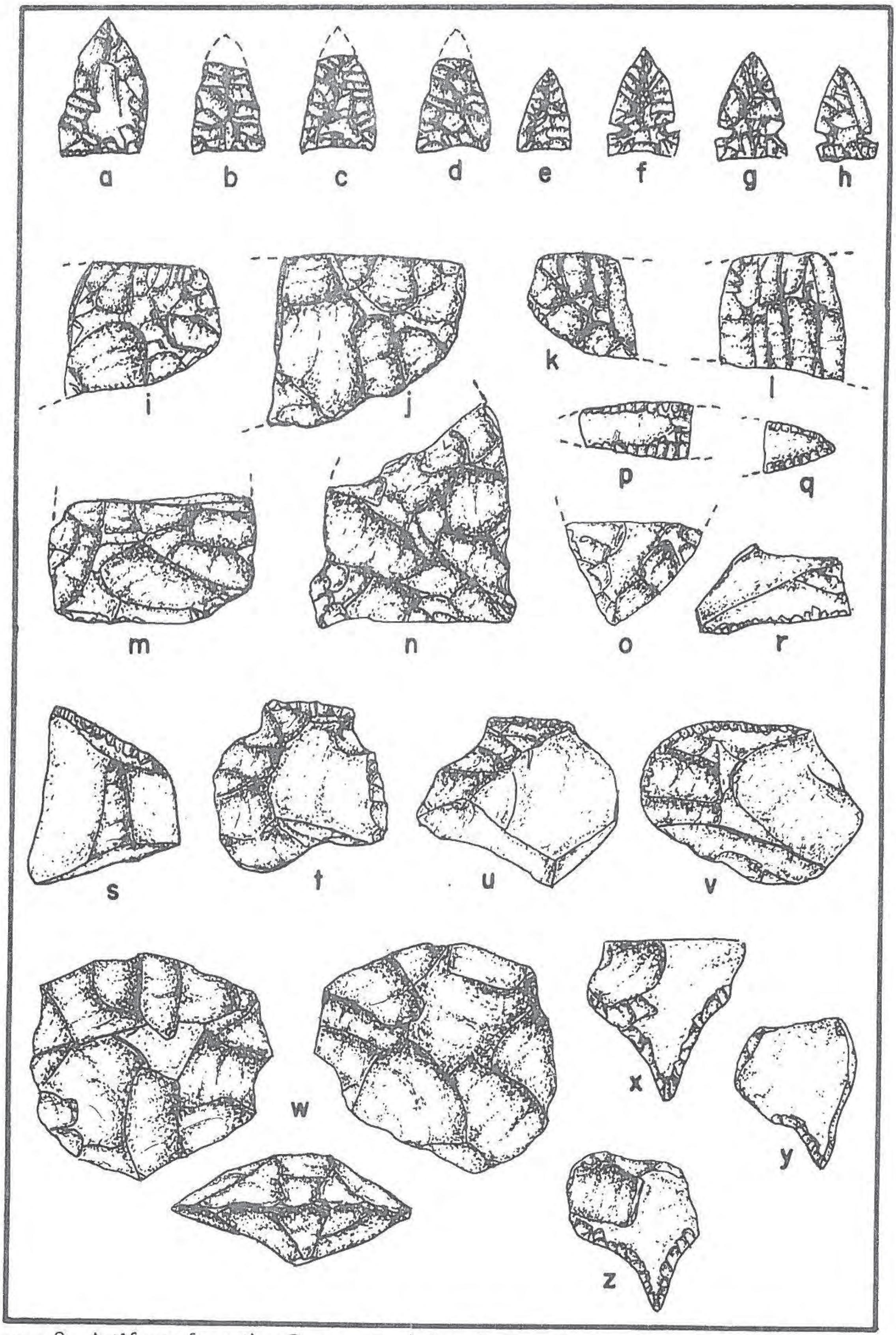


Figure 8. Artifacts from the Gurney Peak Bench Site: Projectile points (a-h), bifaces (i-o), retouched flakes (p-v), discoidal core (w), drills (x-z). (Drawn to scale).

pressure retouch along the edges, with the exception of the last mid section which appears to have been pressure flakes (Table IV).

End scrapers: Four complete and six broken end scrapers were recovered at the site, all plano-convex in cross-section with steeply-beveled working faces. All were made from large flakes, with the bulb of percussion opposite the working end. Unbroken scrapers retain a striking platform at the proximal end at a right angle to the long axis of the flake. Dorsal surfaces are "keeled" by a ridge between flake scars. The scars are apparently the result of preparation of the core. All show pressure retouch or fine, soft-hammer retouch along their working face. The working edges show "nibbling" or scalar use retouch. Two of the scrapers have their working edges rounded off and highly polished, apparently by use against some lightly abrasive substance.

Six of these tools are relatively thick in relation to their width and length (Fig. 9b,c), one is broad and thin (Fig. 9h); three others are also thin but longer and narrower in outline (Fig. 9d, e) (Table V).

Table IV. Bifaces

Description	% Complete	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (grams)	Fig.	Material
Excavated							
1. flat base, notched	50*	-	35	8	10.9	8n	agate
2. flat base, notched corners	30*	-	37	9	9.0	8m	non-local chert
3. rounded tip	-	-	31	9	9.9	8j	agate
4. rounded tip	-	-	22	8	5.4	8i	agate
5. rounded tip	-	-	-	8	2.9	8k	jasper
6. mid section	-	-	23	5	3.2	8l	jasper
7. mid section	-	-	-	-	-		agate
8. point	-	-	-	-	-		non-local chert
Surface							
9. flat base	-	-	28	5	3.6		quartzite

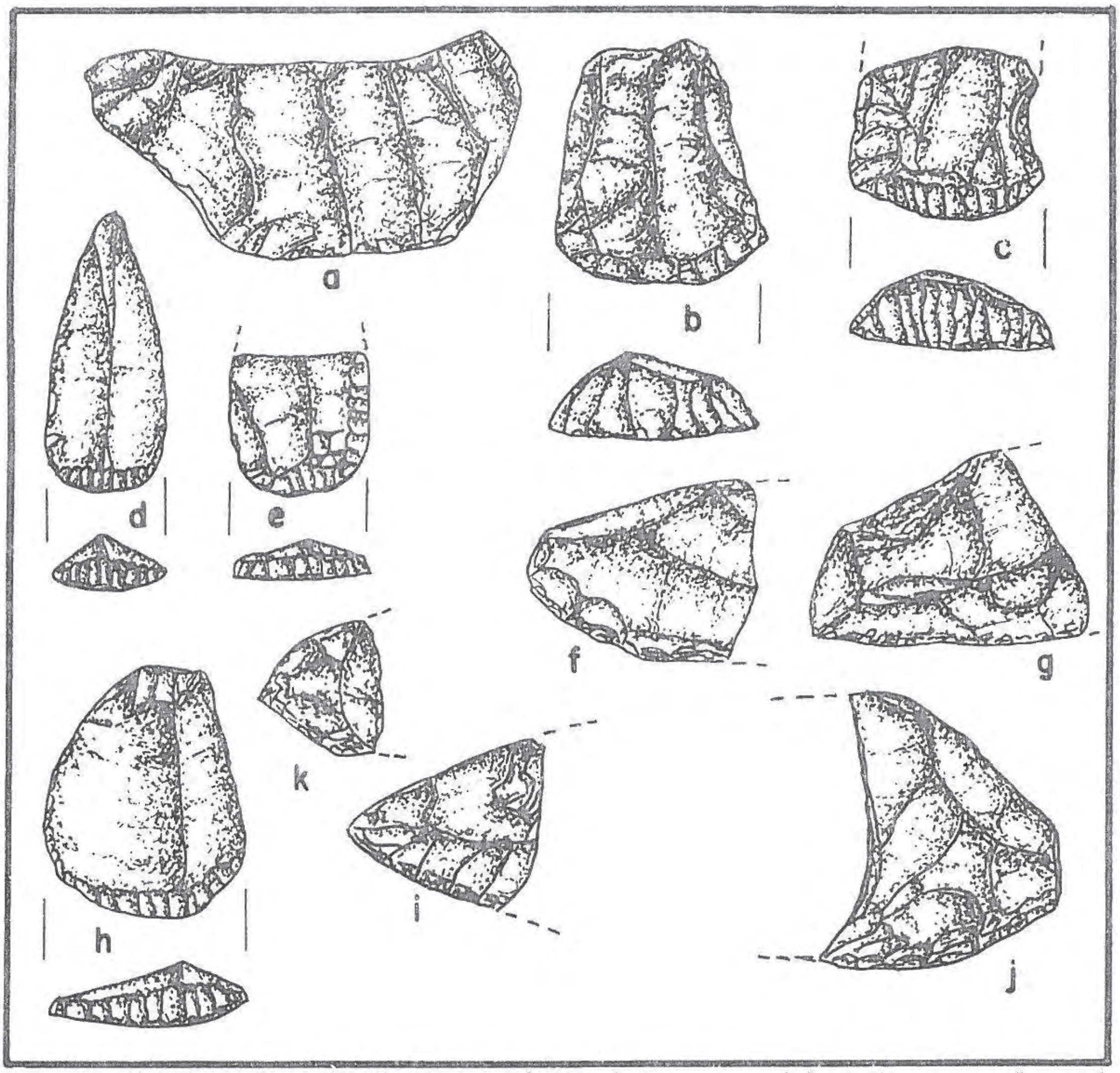


Figure 9. Artifacts from the Gurney Peak Bench Site: core (a), and scrapers (b–e, h), side scrapers (f, g, i–k). (Drawn to scale)

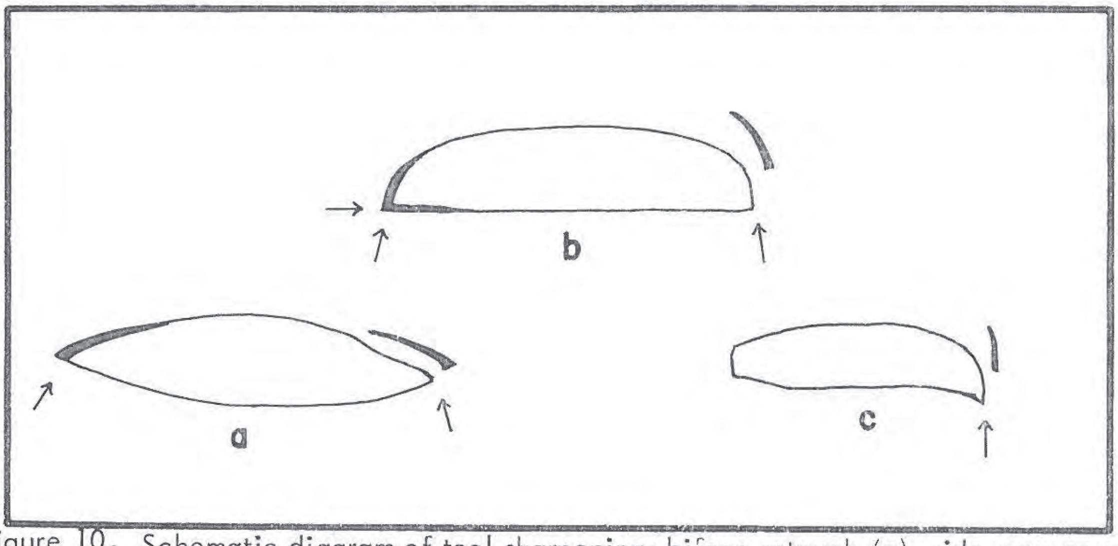


Figure 10. Schematic diagram of tool sharpening: biface retouch (a), side scraper retouch (b), and end scraper retouch (e).

Side scrapers: Ten fragmentary side scrapers were recovered from excavated units representing at least seven different tools. These were made from large, relatively thick flakes trimmed down along one or both sides to form a beveled scraping edge. As reconstructed from these fragments, the side scrapers are tapered to a point at one end and widest nearer the other, more rounded end. Two fragments appear to be from opposite ends of the same tool and are drawn (Fig. 9i, j) to the shape of the complete tool. Dorsal sides are faceted from previous working of the core, and ventral sides are the unmodified, flat inner flake face. Four fragments are from the wider end of the tool (Fig. 9f, g, j), two represent the opposite tapered end (Fig. 9i, k), and four others are undiagnostic fragments of mid sections (Table VI).

Table V. End Scrapers

Description	% Complete	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (grams)	Fig.	Material
1. complete, thick	100	35	29	14	15.7	9b	jasper
2. broken, thick	75	-	28	11	10.4		chert
3. complete, thick	100	35	25	9	9.5		jasper
4. broken, thick	60	-	27	9	8.2	9c	non-local chert
5. broken, thick	20	-	26	9	3.0		jasper
6. broken, thick	30	-	-	-	5.0		jasper
7. broad, thin	100	34	29	6	6.7	9h	agate
8. narrow, thin	100	37	17	7	3.9	9d	agate
9. narrow,thin	40	-	19	6	2.5	9e	jasper
10. narrow, thin	40	-	20	6	2.2		quartzite

Cores: Seven exhausted polyhedral cores were found during excavation. Five are irregular nodules with small flakes removed from several directions. Scars from previous flakes were used as striking platforms to remove flakes from adjacent, roughly perpendicular surfaces. Another core is discoidal in form (Fig. 8w) and another has a flat striking platform with small flakes driven down the sides (Fig. 9a). These flakes meet to form a sharp ridge along the side opposite the striking platform, and one side of this was used as a striking platform in a largely unsuccessful attempt to remove more flakes. Several cores show evidence of having been utilized as small chopping tools (Table VII).

Table VI. Side Scrapers

Description	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (grams)	Fig.	Material
1. base or sider end	-	31	12	17.8	9g	jasper
2. base	-	26	9	8.2	9f	jasper
3. base	-	31	12	17.9		
4. base	-	36	9	10.6	9j	
5. tip or pointed end	-	19	8	2.0	9k	non-local chert
6. tip	-	24	7	3.6	9i	
7. mid section fragments, (4)	-	-	-	-		jasper (2) chert (2)

Table VII. Cores

Description	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (grams)	Fig.	Material
1. discoidal	44	43	19	26.9	8w	agate
2. flat striking platform	69	35	29	63.8	9a	non-local chert
3. irregular, polyhedral	38	35	23	25.0		agate
4. irregular, polyhedral	39	25	15	14.4		agate
5. irregular, polyhedral	37	28	14	18.0		agate
6. irregular, polyhedral	39	31	15	15.0		local chert
7. irregular, polyhedral	71	48	21	91.5		quartzite

Drills: Three flakes were modified into expanding base drills. Two are chipped along both edges to form a point (Fig. 8x, z) and one was chipped along one edge (Fig. 8y). Material are quartzite and agate. All show varying amounts of polish on the first two to three mm. of the tip. A drill tip found on the surface was chipped on all sides and is diamond shaped in cross-section (Table VIII).

Table VIII. Drills

Description	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (grams)	Length of Drill Tip	Fig.	Material
Excavated							
1. flake, chipped from both sides	27	26	7	3.6	13	8x	quartzite
2. flake, chipped from both sides	28	23	4	2.8	12	8z	quartzite
3. flake, chipped from one side	25	22	4	2.3	8	8y	agate
Surface							
1. drill tip	-	-	-	-	18		quartzite

Choppers: One large, gray quartzite chopper came from the surface of the site and was made by removing several spalls from each side of one end of a rectangular cobble. The resulting sharp edge shows signs of heavy usage. Dimensions are 11.7 cm. long, 8 cm. wide, and 6.2 cm. thick, and its weight is 900 grams.

Retouched flakes: Seventy-three flakes from this site show retouch along one or more margins. Nine of these are from the surface, the rest are from excavated units. Four of these consist of a thin, narrow flakes chipped along both edges to form a small pointed tool (Fig. 8p, q). Twelve flakes have rather steeply beveled edges (Fig. 8t, u, v) and use retouch on these edges indicates a possible scraping function. Fifty-seven thin, irregular flakes demonstrate pressure retouch or use-retouch along one or more edges (Fig. 8r, s).

Unmodified flakes: Screening all dirt through 1/4 or 1/8 inch mesh and intensive "gleaning" of the site surface resulted in a large sample of unmodified flakes ranging in size from one or two mm. up to eight cm. These flakes are the result of basically two processes -- core and tool manufacturing, and tool sharpening.

The large majority of flakes classified as manufacturing debris come from cores with striking platforms from large, flat flake scars which are at or near a right angle with the long axis of the flake. A few flakes from bifacial cores show deliberate edge grinding as preparation for striking off the flakes (Table IX).

Table IX. Unmodified Manufacturing Flakes

Material	No. of Flakes	Total Weight	Ave. Wt. Per Flake
Excavated			
1. local chert, agate	534	466.0 g.	.85 g.
2. quartzite	253	185.6	.73
3. jasper	114	72.2	.63
4. non-local chert	99	63.9	.64
Surface			
1. local chert, agate	42	180.8	4.3
2. quartzite	28	31.5	1.1
3. jasper	19	25.4	1.3
4. non-local cherts	20	30.3	1.5
Totals	1109	1035.7	

Tool sharpening flakes are divided into four categories, (a) flakes of bifacial retouch, (b) flakes from sidescraper retouch (two classes), (c) flakes from end-scraper retouch, and (d) unclassifiable retouch flakes. Techniques in this analysis are based on work by Frison (1968:149-155).

Flakes of bifacial retouch are the result of shapening bifaces with lenticular cross-sections. Striking platforms on these flakes form an acute angle, reflecting the angle between the two sides of the biface. Striking platforms consist of a small portion of the old tool-surface and working edge and therefore show flake scars, use retouch, and other forms of wear (Fig. 10a, Table X).

Table X. Flakes From Bifacial Retouch

Material	No. of Flakes	Total Weight	Ave. Wt. Per Flake	Minimum No. Tools Represented
Excavated				
1. local chert, agate	35	15.9 g	.45 g	3
2. quartzites	19	9.1	.50	5
3. non-local cherts	30	10.0	.33	5
4. jaspers	34	5.8	.17	5
Totals	118	40.8		18
Surface				
1. local cherts, agates	1	.4	.40	
2. quartzites	2	.4	.20	
3. non-local cherts	2	1.4	.70	
4. jaspers	4	.4	.10	
Totals	9	2.2		

The second category of flakes are side scraper retouch flakes. Flakes removed from a side scraper (Fig. 10b) differ from bifacial retouch by having striking platforms at a right angle to the adjacent back of the flake. These striking platforms are part of the flat ventral surface of the tool, and the working edge of the tool is evidenced on the back of the flake (Table XI).

Table XI. Flakes From Side Scraper Retouch, Class 1

Materials	No. of Flakes	Total Weight	Ave. Wt. Per Flake	Minimum No. Tools Represented
Excavated				
1. local cherts, agates	21	7.5 g	.35 g	4
2. quartzites	9	1.9	.21	2
3. non-local cherts	17	4.0	.23	4
4. jaspers	20	4.5	.22	5
Totals	68	17.9		15
Surface				
1. local cherts, agates	1	.3	.30	
2. quartzites	2	.6	.30	
3. non-local cherts	3	1.2	.40	
4. jasper	2	.7	.35	
Totals	8	2.8		

Another, smaller group of flakes were removed from the flat side of side scrapers (Fig. 10b). The striking platform of these flakes is part of the scraping edge. The body of the flake has no facets or flake scars on its exterior surface (Table XII).

Table XII. Flakes From Side Scraper Retouch, Class 2

Materials	No. of Flakes	Total Weight	Ave. Wt. Per Flake	Minimum No. Tools Represented
Excavated				
1. non-local chert	1	.1 g	.10 g	1
2. jasper	1	.1	.10	1
Totals	2	.2		2
Surface				
None				

Most of the flakes were removed by soft hammer percussion, as is evidenced by their broad, thin form and a definite overhang toward the bulbar surface. The one end scraper retouch flake recovered, however, appears to be the result of a pressure technique (Fig. 10c). Flake scars on the working edges of end scrapers suggest that most retouching was done by pressure (eg. Fig. 9c,d,e).

Even with a soft-hammer technique, many flakes tend to break about one-half of the way down their length. This leaves a number of distal ends of flakes that cannot be classified (Table XIII). Most of these presumably would fit broken bifacial or side scraper retouch flakes.

Table XIII. Unclassifiable Retouch Flakes

Material	No. of Flakes	Total Weight	Ave. Wt. Per Flake
Excavated			
1. local chert, agate	54	15.0g.	.27g.
2. quartzite	34	7.2	.21
3. non-local chert	28	7.5	.26
4. jasper	28	6.0	.21
Totals	144	35.7	
Surface			
1. local chert, agate	1	.4	.40
2. quartzite	1	.3	.30
3. non-local chert	2	.7	.35
4. jasper	2	.6	.30
Totals	6	2.0	

Ground and Pecked Stone

Three small fragments of milling slabs were excavated and one fragment was found on the surface. Materials are light gray to dark brown sandstones. These range from 2.2 mm. to 8.3 mm. in length, and from 1.1 mm. to 8.3 mm. in thickness. One excavated fragment and the surface findshow pecking marks along one side; presumably they are from the edge of milling stones. All have one surface which is ground smooth.

Ceramics

Two hundred and thirty-six pottery sherds were obtained by excavation, including ten rim sherds. Seventy to eighty percent of the sherds are large enough for various aspects of analysis. Two hundred and forty-one sherds, including four rim sherds, were collected on the surface during several visits to the site. These sherds are smaller in size and slightly less than 50% are large enough for analysis. Excavated sherds range in size up to 7.8 mm.while the largest sherd from the surface is about 3.9 mm. Attempts to fit sherds together were successful in only a few cases.

Body sherds - Color: The predominant sherd color is gray, ranging from light gray to almost black. Buff and red occur less frequently. Most sherds are lighter gray on the exterior and interior surfaces, and dark gray in the core. This difference is not alway apparent on old breaks, but fresh breaks demonstrate it quite clearly.

A buff color appears on either the exterior or the interior surface, or both, with the core usually remaining dark gray. This buff color usually penetrates the sherd only for about one cm. In a few instances a sherd will be buff throughout. Red coloration occurs only on the interior surface of sherds with buff cores and exteriors (Table XIV).

Table XIV. Sherd Coloration

Coloration				
Exterior	Interior	Core	Excavated Sherds	Surface Sherds
gray	gray	gray	121	89
buff	gray	gray	18	21
gray	buff	gray	17	12
buff	buff	gray	10	3
buff	red	buff	7	0
buff	buff	buff	0	3

Gray sherds are believed to be the result of oxidation of carbon in early stages of firing with the final firing done in a reducing atmosphere, as described by Colton (1953:34). Buff coloration is the result of exposure to an oxidizing atmosphere during firing. Buff and gray can probably both appear on a single vessel.

The few red and buff sherds appear to result from a hemitite pigment applied to the vessel interior before firing in an oxidizing atmosphere. Under magnification the red pigment can be seen to cover granules of quartz sand protruding from the paste. The durability of the pigment argues for its being baked on, and the buff color throughout the sherd is evidence of an oxidizing atmosphere.

Paste: Paste is friable and crumbly with thin laminations occurring throughout. These laminations give the paste a flaky appearance. Laminations run roughly parallel to the surface of the sherd and in some instances parts of a sherd will split apart along these lines (Fig. II). Local exposures of the Brule Formation would have provided clay for vessel manufacture.

Temper: Temper consists of moderate amounts of quartz sand, ranging from medium (0.5 - 0.25 mm.) to very coarse (1.0 - 2.0 mm.). These grains range from rounded to angular and rounded. Amounts vary from sherd to sherd but seldom approach extremes of scarcity or abundance. Local sources of this temper may have

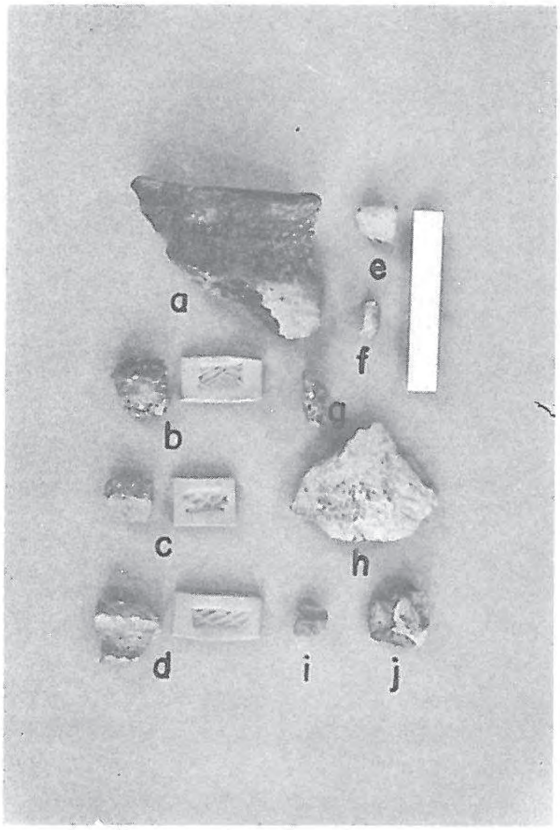
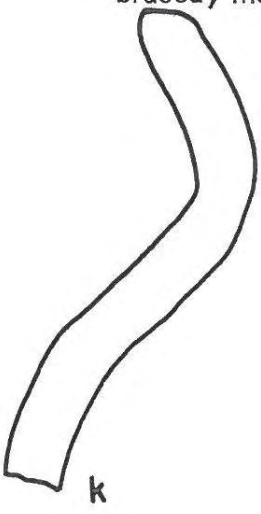
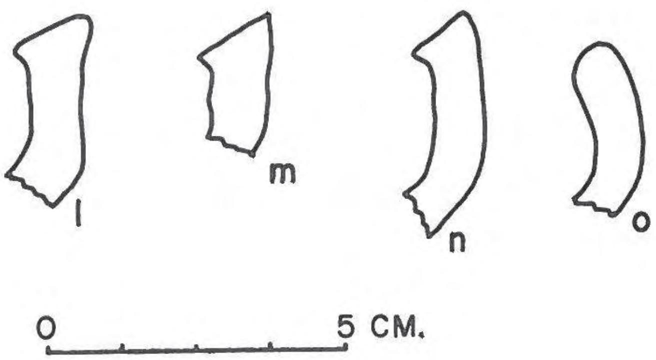


Figure 11. Ceramics from the Gurney Peak Bench Site:
Flaring rim sherds with plain rounded lips (a,e,f (in profile)), rims with braced, incised lip (b,c,d,g (in profile), i), body sherds (h,j).

Rim profiles (below), k (of a, above), l (of b, above), m (of c, above), n (of d, above), o (of e, above), k-9, drawn to scale).





been from sandstone, streams, and sand dunes, or to some extent natural inclusions in the Brule clay.

Hardness: Equipment for accurate testing of hardness was not available, but a reasonable estimate would place most sherds around three or four.

Thickness: Sherds from both excavation and surface collecting range between 4 mm. and 10 mm. in thickness, with about 90% of the sherds falling between 6 and 8 cm.

Surface treatment: Exterior surface treatment is basically of two types - cord-marking, and cord-marking followed by smoothing. Cord marks in all cases were the result of twisted two-strand cordage with a "Z" or counterclockwise twist. Cords average one to two mm. in diameter, and marks on the vessel surface usually range from 0.25 mm. to 0.75 mm. in depth. Cord marks are usually parallel and occur from three to six per centimeter. These appear to run vertically up vessel surfaces to the juncture beween the neck and shoulder of the vessel. An occasional sherd has a second set of cord markings applied at an angle over other markings.

Most sherds were smoothed, ranging from very lightly to complete obliteration of cord-markings. Only fifteen excavated sherds and eighteen surface sherds appear to be unsmoothed. Varying degrees of smoothing occur on single vessels. The greatest amount of smoothing occurs on the upper part of the pot near the neck. Numerous striations indicate that smoothing was done horizontally across the cord markings.

Interior surfaces are smoothed (also horizontally) with frequent shallow depressions which are taken to be anvil marks.

Manufacturing and shaping: The manufacturing method is inferred to be paddle and anvil molding from a lump, with addition of patches as manufacture progressed. Paddle and anvil marks are obvious, and patch-building is evidenced by numerous prominent laminations. All sherds of any size have a slight curvature both horizontally and vertically, indicating a globular vessel form.

Rim Sherds: Color, temper and paste of rim sherds follows that described above, except for an absence of red coloring.

Rim sherds from this site are of two general types - (a) flared with plain, rounded lip, and (b) flared with braced rim and incised lip. These rims represent at least four vessels.

Five plain, rounded rims came from excavations and three were surface finds. One sherd consists of a flaring rim, the constricted neck, and part of the shoulder. It is 7.3 cm. wide, 6.1 cm. high, and averages about .9 cm. thick. Color is gray to almost black. Partially obliterated cord marks occur in the angle between shoulder and rim, but are smoothed away elsewhere. The curvature of the constricted neck indicates a vessel oriface of approximately 10 cm.; diameter of the lip would have been about 12 cm. (Fig. 11).

The six other rims of this class come from the flaring rim above the neck. Heights range between 1 cm. and 2.2 cm., and thicknesses usually range between 6 and 7 mm. One is 11 mm. thick (Fig. 11).

The other class of rims comes from slightly less flaring rims broken at the constricted neck or above. These rims range from 1.4 to 2.9 cm. in height and from 9 to 11 mm. in thickness. Each has a thickened or braced lip, wedge-shaped in cross section, giving the rim a collared look. The flat, exterior surface of this "collar" is from 9 to 12 mm. wide.

Incised decoration on the flat exterior part of this wedge consists of a series of intersecting diagonals, giving the effect of a row of "X"'s joined at the top and bottom (Fig. 11). Three others have incised series of oppossing diagonals, giving the effect of separate triangular areas filled with alternating left and right slanted lines (Fig. 11). The remaining sherd appears to have an incised design, but roughness and smallness of the collared area make it too indistinct to classify.

Faunal Material

Numerous fragments of bone were scattered through excavated units, usually within a few inches of bedrock. Most of this material is from a mature buffalo (Bison bison) and a few fragments might be from an immature buffalo. One small phalange and pelvis fragment are from either mule deer (Odocoileus Lemicnus) or angelope (Antilocapra americana).

With the exception of one buffalo hoof core, all bone was broken during butchering processes. Identifiable fragments of buffalo bone include parts of most skeletal elements, but about eighty percent are from long bones. Unidentifiable fragments, weighing about 900 grams, are about ninety-five percent long bone fragments.

Discussion of the Archaeological Evidence

The Gurney Peak Bench Site is well situated for utilization of diverse local resources. Horse Creek and the adjacent stream valley, the uplands, and the scarp system all occur within three or four miles. A large part of the Horse Creek Valley and the lowlands north to Goshen Hole can be seen from the site. Water is available at the foot of the point on which the site is located, and numerous trees for wood grow along the back of the site. Although the presence of a human group would have kept game away from the nearest stream, numerous similar streams occur east and west along the scarp system. The exposed nature of the site would argue against its use during winter.

The artifact assemblage reflects a hunting orientation. However, the few fragments of milling stones probably do not give an accurate picture of the amount of plant food utilized. The predominance of snapped-off ends of tools (bifaces, end scrapers, side scrapers) seems to indicate that many of these tools were hafted. There is some evidence for this in the light polish which occurs across flake-scar ridges on a few of these tools. The rounded-off working edges and polished working faces of two end scrapers suggests that the tool must have been used in an almost vertical position to produce this wear. The different types of wear seen on these tools, and the differences between thick, heavy end scrapers, and light, thin ones argues for multiple types of usage, and other types of tools could also have been used for several processes.

Locally-occurring agates and cherts were the most commonly found material. The proximity of this source is reflected in the manufacturing debris. Many of these flakes had rough limestone cortex adhering to them, indicating chunks were being brought to the site and subsequently cored. Jaspers and finer cherts presumably come from the Hartville Uplift or the Laramie Range, fifty to one hundred miles away. These materials were transported to the site as already prepared cores, or as tool blanks. Manufacturing flakes are smaller and no cortex is found on them. In this context, it is interesting to note a cache of twenty-two jasper biface blanks found by the author in the Pine Bluffs locality (Reher 1969:14). The distance to sources of finer material is reflected in the cores, which are exhausted. Analysis of lithologic types of tool-sharpening flakes indicated that many more tools were used at the site than were actually found.

Ceramics are clearly related to the Upper Republican pottery of Nebraska first described by Strong (1935:245-250). Further discussion of ceramic affiliation will be confined to Chapter VI, after all sites have been described.

Certain butchering techniques are evidenced by the bone material. Many fragments appear to be the result of butchering in the field and transportation back to a base camp. This technique, defined by Frison on material from kill sites, consists of chopping loose muscle attachments which are then retained with the meat as it is stripped off (1970). Many of the skeletal elements or pieces of skeletal elements which are missing from the buffalo jumps and traps are the ones which occur at this site. This includes two medial tuberosities and one medial condyle of humerii, part of the intercondyloid groove of a femur , the medial condyle of a tibia, part of a tuber coxae and pubic symphysis from a pelvis, most of a patella, and the other part of the posterior articulatory surface of an atlas vertebra.

A few other butchering processes are evident. Five lumbar vertebra have spinous and transverse process broken off, and are broken through the neural arch below the transverse branch on one side and above the transverse branch of the other. Long bone fragments indicate that some of these, or parts of them were also brought back to camp. This would have been to obtain the marrow, and perhaps as material for tools. The muscle attachment fragments mentioned above do not reach the marrow cavity and are not related to this process. Several phalanges were broken to obtain marrow, and various other skeletal elements occurred, though infrequently.

To be continued in June Issue............