THE WYOMING ARCHAEOLOGIST

SYMPOSIUM

JUNE 1981 SEPTEMBER 1981

24(2-3)

THE WYOMING ARCHAEOLOGIST is published quarterly by the Wyoming State Archaeological Society, George W. Brox, Editor. Address manuscripts and news items for publication to: THE EDITOR , 1128 - 11th Street, Rawlins, Wyoming, 82301.

NOTE: Membership period is from January through December and includes all issues published during the current year regardless of the month the subscription commences. All subscriptions expire with the Winter Issue and renewals are due the first part of January each year.

NOTE: If you move or have a change of address, please notify the Executive Secretary, Mimi Gilman, Box #1091, Saratoga, Wyoming 82331. Your WYOMING ARCHAEOLOGIST will not be forwarded unless a payment of 50¢ is received for return and forwarding postage.

NOTE: Checks for Chapter Subscriptions and renewals should be sent to the Chapter Secretary involved. All other checks, subscriptions, and renewals should be addressed to: Milford Hanson, Route #1, Box 1080, Cody, Wyoming, 82414. Correspondence and orders for back issues should be addressed to Mimi Gilman, Box #1091, Saratoga, Wyoming 82331.

* *

1981 MEMBERSHIP NOTICE

WYOMING ARCHAEOLOGICAL SOCIETY, INC.

__________ Individual Associate Membership @ $10.00 per year.

__________ Single Active Membership @ $10.00 per year. __________ Chapter Name

__________ Family Active Membership @ $15.00 per year. __________ Chapter Name

__________ Institutional Membership @ $15.00 per year.

__________ Other Membership, including: Supporting, Yearly
Contributing, Yearly

Please make your checks payable to WYOMING ARCHAEOLOGICAL SOCIETY, INC.

NAME: ____

ADDRESS: ____

CITY: ______________ STATE: ______________ ZIP CODE: ________

A P P E N D I X C

TABLE OF CONTENTS

WYOMING ARCHEOLOGY SOCIETY
MINUTES OF THE SPRING MEETING APRIL 24-25, 1981

FRIDAY EVENING, APRIL 24, 1981

A formal business meeting was held Friday, April 24, 1981. Donald Gilman and Henry Jensen were appointed to audit the treasurer's books.

CALL TO ORDER AND WELCOME

The Annual Meeting of the Wyoming Archaeological Society was called to order at 7:30 p.m. by Grover Phelan, President, at the Sheridan Junior College, Room 1, Sheridan, Wyoming. Margaret Powers of the Sheridan Chapter welcomed everyone that was present and reported that arrangements had been made for those who wished to have lunch at the Sheridan Inn during the meeting on Saturday.

PARLIAMENTARIAN

President Phelan announced that the Parliamentarian would be absent.

CREDENTIALS COMMITTEE AND VOTING DELEGATES

President Phelan reported on credentials and voting delegates. These delegates are as follows: Cherokee Trail-Deborah Chastain and Ada Jackson; Casper-Helen Bryant and Evelyn Albanese; Cheyenne-Doug Olingue and Mrs. Olingue; Northern Big Horn-Milford and Imogene Hanson; Sheridan-Jerry Carboni and Margaret Powers; Sweetwater-No one attended; Fremont-Larry Osborne and Lou Ann Benesh.

SECRETARY'S REPORT

President Phelan asked to approve not reading the minutes for the 1980 annual meeting as written and distributed at the 1981 annual meeting and to waive reading the minutes, this motion as moved, seconded and passed.

TREASURER'S REPORT

It was moved, seconded and passed, the treasurer's report as read by Milford Hanson, Treasurer, and approved by the Auditing Committee. (See next page.)

A discussion followed with regards to the Foundation report and reinvestment, Treasurer Hanson reported the Foundation this year has a total of $1250.34 to spend as they see fit.

Beginning Balance Checking		$1045.32
Deposits to 4-6-81		$2407.91
		$3453.23
Expenditures:		
Editor Exp.	$ 300.00	
Secretary of State	$ 3.00	
Treasure Exp.	$ 143.38	
State Meeting Exp.	$ 73.49	
Scholarship	$ 350.00	
Refunds	$ 20.00	
Bad Check	$ 6.00	
Safety Deposit Box	$ 5.00	
	$ 900.87	
Debit Memo	$ 122.00	
	$1022.87	
Balance Checking 4-6-81		$2430.36
Savings		$4288.00
		$6718.36
Net Worth 4-1-80		$5333.32
Gain		$1385.04

EDITOR'S REPORT

George Brox, Editor, apologized and reported on the delay of the Wyoming Archaeologist, the articles and pictures have been in Cheyenne since February 2. Brox also reported on confusion with labels for mailing, it is a matter of which secretaries in each chapter should be aware of when dues are paid. It was finally agreed that the Editor would send extra copies to each chapter to be made available for those people who do not receive a copy of the Wyoming Archaeologist.

Brox asked of the membership if anyone had in their possession a complete file of the Archaeologist so that he might be able to make copies. Milford Hanson will lend his files to George. Brox also offered to help Mary Helen Hendrix bring Casper's library up to date when he is finished with his own file.

CERTIFICATION PROGRAM

President Phelan turned the meeting over to Tom Larson for a report from the Certification Committee.

Tom Larson presented a summary statement. Several states have sent him copies of their certification program.

Tom recommended the committee get an extra year extension so that we could develop our very own program. Tom Larson also suggested that the Forest Service and BLM approve of our certification program.

Henry Jensen reported that what is good for Wyoming might not be what works everywhere else; that our certification standards should comply with several agencies.

It was recommended by the membership that the committee continue its research and that the new President and immediate Past-President meet with the different agencies to see how this problem could be solved.

Milford Hanson questioned the number of hours needed for certification. Some training programs being from 30 to 60 hours of training. It was suggested the Archaeological Society coordinate different programs with Junior Colleges throughout the state.

Tom Larson then spoke of the problems for the volunteer and the professional archaeologist. He stated risks would have to be taken both by amateurs and professionals and that the professional archaeologists should have the final say.

NEW BUSINESS

Milford Hanson spoke about our large checking and savings account, he asked for suggestions from the membership. He suggested not to spend all of our monies as in the future it looks as if we will have to print the Wyoming Archaeologist ourselves. He then suggested a CD.

Bob Randall made the motion to have Milford Hanson invest the money as he sees fit, Ada Jackson seconded the motion and motion was passed.

President Phelan welcomed back the Gillette Chapter back into the fold, they had a representative at the meeting, Ms. Carolyn Moran.

Under new business Olingue spoke with regards to the Mulloy Scholarship--He complained that chapters were switching their allegiances--that the Cheyenne Chapter felt they should have a member on the scholarship committee.

Grover Phelan made the suggestion that the University have the last say so on the scholarship, the committee have a hard enough time last year after reading the applications.

A question was posed with regards to Junior Colleges scholships at which time there was a report of two memorial scholarships at Casper College.

Bob Randall asked Mr. Phelan who was in charge of the Scholarship Committee and he reported it was Carolyn Buff and Laurie Phelan.

Carolyn Moran from the Gillette Chapter asked suggestions from different clubs to improve their own club. Mr. Olingue reported that his chapter is showing the Ascent of Man film series by Boronowsky. Ada Jackson reported on the Atlatl Contest and the opening of the exhibit 25,000 Years of Man in Wyoming at the Saratoga Historical Center July 25, also she reported on our summer meeting to be held at Camp Paleo in Saratoga.

ELECTION OF OFFICERS

President Phelan announced the names of those chosen for office as presented to him by the nominating committee, they are as follows: Bob Randall, President; Jerry Carboni, 1st Vice President; Carolyn Buff, 2nd Vice-President; Milford Hanson, Treasurer.

Imogene Hanson motioned that those chosen be unanimously elected. Mildred Jensen seconded and motion was passed. (Mimi Gilman was appointed as Secretary by President-Elect Randall.)

President Randall accepted his duties and turned the meeting for Saturday to Mark Miller.

Milford Hanson commanded a round of applause for out-going President Grover Phelan for all of his hard work.

With this Donald Gilman made the motion the meeting be adjourned, seconded by John Gilman. Meeting adjourned at 9:10 p.m.

SATURDAY, APRIL 25, 1981

PAPERS PRESENTED AT SPRING MEETING

The topic for the spring papers was Prehistoric Settlement and Subsistance Along the North Platte River In Colorado and Wyoming and chaired by Dr. Mark Miller. The papers were excellent and will be printed in the *Wyoming Archaeologist*. The different topics were as follows:

Holocene Paleoclimates in Eastern Wyoming by John Albanese
Settlement Pattern Studies of the Hanna Basin by David Reiss
Big Ditch Locales and Tool Kit Comparisons by David McGuire and Kathie Jayner
Archaeology In The Carbon Basin by Jana Vosika Pastor and Rhoda Owen Lewis
Plains Woodland and Upper Republican Occupations in Southeastern Wyoming by Charles A. Reher
Prehistoric Settlement Factors In The Medicine Bow Area of Wyoming by Christian Zier, Wm. M. Loker, Denise Fallon, and John Bradley
Continuing Investigations at the John Gale Site near Rawlins by Mark Miller

Settlement Systems in North Park by Joseph Lischka
The River Bend Site by Carolyn Buff
Implications of Ethnoarchaeology Among Wyoming Pastoralists for Hunter Gatherers by Bill Fawcett

DR. GEORGE FRISON DISCUSSANT

Dr. Frison praised all the papers and the good ideas presented at the Symposium. He suggested that 3 days be devoted for this kind of presentation. The reports showed problems with the altithermal period, and hope this problem may be solved someday. He considered all the reports to show a wide diversity of analysis, and the wide variety of manifestations. He also discussed temporal controls being important and that more carbon dating should be done. He pointed out that the River Bend Site --Protohistoric--shows the need to have resources, manpower and money for those sites that are endangered. Dr. Frison also pointed out the importance of the Garret Allen Site considering it a key site in the state. His last statement came as a plea. The need for a state archaeologist who should be a full time person and that the whole membership contact and prepare itself for the next Legislature session by contacting their immediate legislators and possibly we could form a Lobbying group. At this time, Dr. Frison asked for suggestions and volunteers. President Bob Randall promised to investigate how we could form a lobbying group. Further discussion took place with people exchanging ideas on how to improve the visibility and education of Archaeology throughout the state.

Bob Randall gave a short history of his involvement in the Society and he talked about making an effort to reunite the whole society. He introduced his slate of officers and reappointed the Certification Committee with John Gilman as the new member. (Mr. Larson prefers that a non-professional be involved in doing this.)

President Randall announced that Rawlins would be the site for our Spring meeting with George Brox as organizer.

Time as announced for a Foundation Breakfast meeting at 9:00 a.m. at the Sheridan Inn and everyone was welcome to come.

Dr. Frison then asked for special time to thank Mark Miller on his efforts for a good show.

ADJOURNMENT

There being no further business, President Randall adjourned the meeting at 4:00 p.m.

BANQUET

The Banquet was held at the Sheridan Inn at 8:15 p.m. President Randall thanked the Archaeological Society and the Sheridan Chapter for their excellent planning of the dinner and for being a wonderful host.

Margaret Powers said a few words to the membership apologizing for any inconvenience. She thanked her committee and reminded us the Sheridan Chapter had been the first organized chapter in the state.

Carolyn Buff announced the names of the Scholarship winners. This year two scholarships were presented, they were Allen Darlington and David Reiss. Mr. Reiss thanked everyone for the scholarship and for having been invited to be in the Symposium.

Milford Hanson presented the Golden Trowel Award, this year going to Mr. George Brox. Chuck Reher made a special toast to George calling him "The Inventor of the Scotch Sandwich."

President Randall then had all chapters stand up as they were called, present were: Casper, Cheyenne, Lander, Northern Big Horn, Sweetwater, Gillette, Cherokee Trail and Sheridan.

Dr. George Frison had a resolution in a form of a motion for George Zeimens. Be it resolved that the Wyoming Archaeological Society acknowledge the many contributions of George Zeimens to Wyoming Archaeology and to the interests of the society and that the Wyoming Archaeology Society extend their sincere wishes for this continued association. Motion seconded and passed unanimously.

Mrs. Gilman then was instructed to write a letter to George Ziemens letting him know how we appreciate him.

Dr. Frison introduced our Banquet speaker, Dr. Rob Boonichsen, from the University of Maine. His talk was "Paleo Indians of the Northeast Coast." Dr. Boonichsen's presentation using slides and an extremely descriptive narrative, showed clovis man in the East. The presentation was very informative and enjoyable.

President Randall thanked our speaker and concluded our meeting at 9:30 p.m.

Respectfully submitted,

/s/ Mimi Gilman
State Secretary

INTRODUCTION

By Mark E. Miller

The 1981 Spring meeting of the Wyoming Archaeological Society was held on the last weekend of April in Sheridan, Wyoming. Grover Phelan, W.A.S. President, requested a symposium for the program. Due to the large number of archaeological projects that have been undertaken in recent years in Wyoming, this seemed like an excellent opportunity to select a broad symposium topic that was regional in scope and was directed toward bringing a diverse body of research together to illustrate the need for synthesis of a growing data base. The topic of "Prehistoric Settlement and Subsistence Along the North Platte River in Colorado and Wyoming" was chosen to exemplify this need.

Archaeological research on the North Platte River goes back to the early decades of the twentieth century and through the years of the River Basin Surveys. Since that time, Dam construction, reservoir backwaters and a rapidly moving energy development industry have exposed and sometimes destroyed prehistoric sites. Fortunately, recent antiquities legislation has made it possible to increase the number and intensity of archaeological investigations in this region. The result has been the systematic recording of hundreds of archaeological sites. Consequently, we are accumulating a data base that could not have been anticipated only decades ago. The question now is, what are we going to do with this data?

Thanks to the pioneering efforts of archaeologists like William Mulloy and George Frison, we have a good baseline for the cultural chronology of the region. Frison's research on forager lifeways and hunting practices also provides a model for current interpretations and for future investigations. The subject matter of the symposium, that of settlement and subsistence, focuses on one logical direction our research can lead us today. Given a well developed regional cultural chronology and knowledge of the general subsistence base, we are faced with the monumental task of explaining cultural systems which account for the variability in a rapidly expanding archaeological record. It should be clear that we need to begin to synthesize this data base to provide more effective management of cultural resources, and to facilitate future scientific investigations. This process must follow the standardization of terminology for site designations and of investigative techniques. The articles presented are not offered as a regional synthesis of North Platte River archeology, but rather as an illustration of the expanding data base, the diverse approaches to that data and the need for synthesis so regional models of settlement and subsistence may be formulated. Once this process is set in motion, we can develop general hypotheses on a regional scale to be tested through cooperative interdisciplinary research.

Eleven archaeologists from Wyoming and Colorado participated in the one-day symposium. Their papers covered a diversity of topics related to the general theme of settlement and subsistence. Subjects ranged from new perspectives in paleoclimatic research to the results of long term site investigations and large block surveys. Articles in this volume represent a sample of the papers from the symposium. As more research develops, a companion volume may follow.

CARVING STEATITE

by

Helen Bryant

Steatite is a secondary mineral, probably formed by alteration of magnesium silicates, with a hardness of 2.7 to 2.8. Deposits are massive, rarely have free crystals, and contain embedded micaceous flakes and masses. Steatite can be white, apple green, greenish-gray, almost black, buff, cream, salmon, and is most commonly fine-grained. It is greasy to pearly in texture, is easy to cut, translucent to opaque in appearance.

It was inevitable that man would find various uses for this massive, easily cut material; ranging from utilitarian cooking and storage vessels to the more sophisticated beads, pipes, effigy forms; the latter having probable religious significance in various cultures. Babylonians used it for cylinder seals. Egyptians found it was effective as a base for some of their faience figures, which were then fired to fuse the glaze. Modern man uses it for ceramics, roofing, cosmetics, foundry facings, steam pipe and boiler coverings, electric switchboards, laboratory tabletops, stoves, etc.

Since prehistoric man had only what nature provided to manufacture his tools and I wanted to learn what methods and tools he might have used, items were selected from the "discarded, reject, and flake" pile. It soon became evident which types and shapes would be most effective in removing excess weathered material and those that would be appropriate for subsequent carving.

The first step in the process of carving steatite is the removal of the weathered "rind". The percussion method, using naturally shaped stones, removed much of the uneven surface and "rotten" areas. (Top row of picture. Percussion tools and piece of raw steatite.)

Next, large, thin, sharp edged flakes were used to cut away the remaining weathered surface. Straight or serrated cutting edges were the most effective. (Refer to second row in picture.)

At this point the form to be completed emerges, i.e., fish, bird, lizard, thunderbird, etc., although a bowl always seems to be a bowl right from the start. The effigy form of primitive work seems to be my medium. For this stage, various sized stone tools are used; curved edges, straight cutting edges, some with graver tips. The graver is useful in etching the design to be carved, or the area of material to be removed as in the case of the center of a bowl. (Second row in picture.)

Sandstone pieces, grading from coarse to fine, will remove nearly all the tool grooves, leaving a relatively smooth surface. To acquire a polish on the finished product, water and a piece of chamois (or any cured animal skin available) will do the trick, i.e., rubbing vigorously with the chamois (or skin) to dry the surface. A high polish results from rubbing with the hands; the natural oil being absorbed by the porous steatite. Primitive man's hands did a better job since he probably didn't do much hand washing after handling animal meats/fats. (Third row, completed carvings.)

After examining available steatite pots and shards, I am reasonably certain of the method used in separating the pot/bowl form from the mother rock and removing the excess center material. To date, I have not acquired the tools I believe to be suitable to test my theory through practical application.

I have attempted to fire-blacken pieces of steatite to simulate that found in steatite shards but so far I have been unsuccessful. Actual duplication of the primitive food/fire conditions is undoubtedly a requirement.

David Baskett, Henry Jensen and Mary Helen Hendry contributed the steatite. Helen Lookingbill and Juanita Hinthorn gave me unusual tools. Leon Campbell did the photography. A simple "thank-you" to all of them doesn't seem adequate.

UPLAND OCCUPATION ALONG THE NORTH PLATTE RIVER IN CENTRAL WYOMING: PRELIMINARY RESULTS OF E.O. 11593 SURVEYS AT ALCOVA AND PATHFINDER RESERVOIRS

by

Thomas R. Lincoln

In 1971, Executive Order 11593 was signed into law by President Richard Nixon. This executive order mandates the Federal Government to take a leadersip role in the identification and protection of cultural resources and calls for an inventory of federally managed lands to identify cultural resources. In addition, determinations of National Register significance are required for each resource. In 1979, the Bureau of Reclamation, Lower Missouri Region, began its E.O. 11953 compliance program. Initial surveys were conducted at Alcova and Pathfinder Reservoirs located in central Wyoming (Figure 1). The entire 3372 acres comprising Alcova Reservoir have been surveyed, while only 4140 acres from the northeast portion of Pathfinder Reservoir have been completed. These figures represent about 10 percent of the total North Platte River Project acreage. Thirty-three cultural resources have been recorded of which 31 are prehistoric or contain prehistoric components. Only the prehistoric sites are discussed in this paper. The data presented offer at least an initial analysis of the resources and allow us to make some preliminary observations about the prehistory of the area.

The lands surrounding Alcova and Pathfinder Reservoirs are upland areas which include some mountainous zones, and paralleling the river, lowland areas. Vegetation, for the most part, consists of types common in a sage steppe type environment. Land areas were as much as 350 meters above the prehistoric riverbed. Because of the geographical restrictions, our survey results probably do not represent the entire range of resource type for this area and for this reason must be considered biased. However, even with this source of error, a reasonable assessment of the area's archaeology can be made.

Because the archaeology of these areas is so poorly understood, our initial responsibility was to define and understand the data base. Our first priority then, was to determine site types, chronology, and hopefully, site formation processes. With these things in mind, our research and long-range goals center on relating the data we recover to regional problems of human behavior. Specifically, our interests concern defining culture change and continuity as perceived from settlement and land-use patterns, group migration, and technological development. Reclamation's long term study along the North Platte River is vital for reaching these goals.

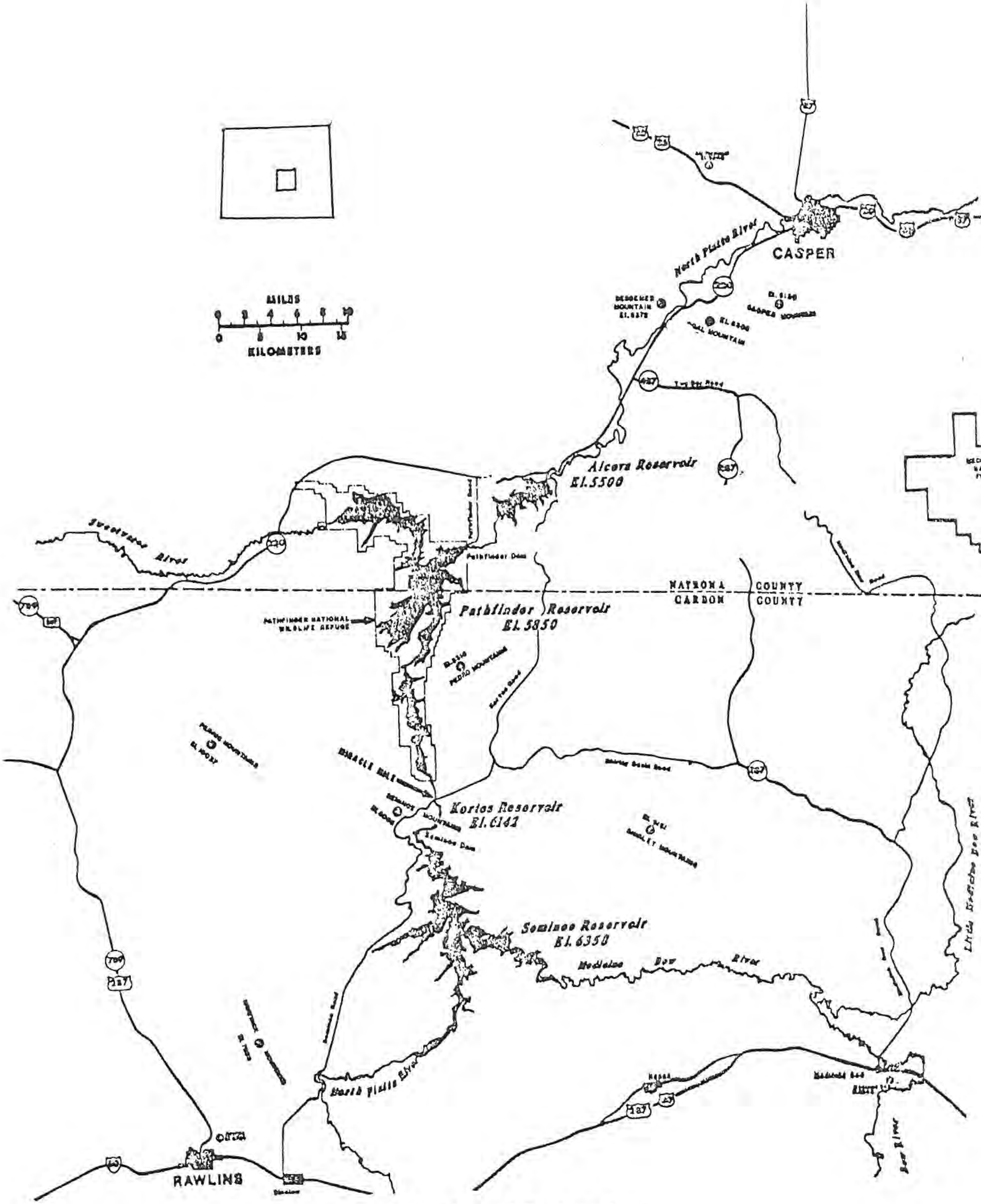


Figure 1: Map of Project Area

One of the more important questions to be addressed is what are the site types for the region. Wyoming archaeology is noted, and often coveted, for its glamour sites (i.e., bison kills and Paleo Indian sites). However, this luxury was not perceived for our project; and in fact, it has not yet been realized. Because of our data base, our efforts have been centralized on the ubiquitous but often ignored lithic scatters which in quantity dominate the landscape.

When making site type determinations, there is one crucial factor that must be measured; that is, site variability. I have approached the analysis of site variability from four separate yet complimentary ways. Two analytical techniques are quantitative measures of: (1) artifact category presence or absence; and (2) artifact type. These measures provide a categorization of prehistoric technology and indicate the presence of artifact production, maintenance, and/or use within a site. These two measures allow for an intuitive classification of site types based on technological complexity (Carmichael 1977). To compliment the quantitative observations, species diversity measures are used, particularly similarity and equitability values (for discussions of these measures, see Pielou 1975; Falk and Pepperl 1981; Wood 1978). The similarity index (.0 to 1.0) compares two assemblages and provides a means to express inter (or intra) assemblage diversity and potential assemblage diversity; consequently, a high equitability value indicates that an assemblage is approaching, or has reached, its most complex state.

When the four measures are used together, they enable one to approach the important questions of site variability and complexity. From these, site types determination can be made.

The intuitive analysis of tool categories and types indicates the presence of site types as listed in Table 1.

Twelve artifact categories were used to identify general site activity. These are listed in Table 2 and include one core category, two debitage categories, and nine tool categories.

Assemblage similarity values for each site are shown on Figure 2 and Table 3. Based on the clustering of the values, these data seem to suggest four and five site types present for Alcova and Pathfinder Reservoirs respectively. Unfortunately, similarity measures are indicators of trends and are not conducive to statistical correlation. The most similar sites at Alcova are large camps while at Pathfinder, they are material acquisition locales.

Ranked equitability values are shown in Figure 3. The linear representations for the reservoirs are separated by quite a degree. For Alcova sites the mean equitability value is 0.4045 while for Pathfinder sites it is 0.6448. Clearly, sites from Pathfinder Reservoir approach maximum diversity to a much greater

Table 2. List of Artifact Categories.

TOOLS	CORE	FLAKES
PIERCING	CORE	THINNING/RESHARPENING
CUTTING		DEBITAGE
SCRAPING		
SHAVING		
GRAVING		
CHOPPING		
HAMMERING		
SPLITTING		
UTILIZED FLAKES		

Figure 2. Plot of Similarity Measures By Reservoir.

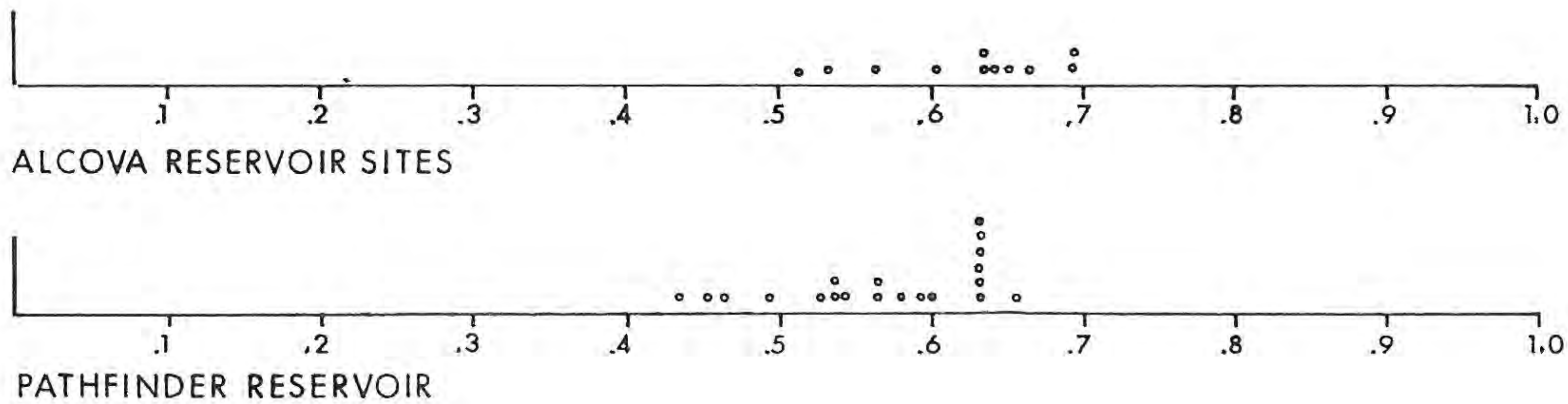


Table 3. Ranked Similarity Scores.

ALCOVA RESERVOIR	PATHFINDER RESERVOIR
48NA388 = .6914	48NA397 = .6574
48NA392 = .6914	48CN1394 = .6318
48NA384 = .6626	48NA396 = .6318
48NA394 = .6535	48NA398 = .6318
48NA385 = .6407	48NA400 = .6318
48NA391 = .6372	48NA401 = .6318
48NA386 = .6356	48NA402 = .6318
48NA393 = .6043	48NA395 = .6002
48NA389 = .5643	48NA408 = .5921
48NA387 = .5317	48NA406 = .5794
48NA390 = .5136	48NA410 = .5667
	48NA407 = .5638
	48NA403 = .5415
	48NA399 = .5388
	48NA404 = .5384
	48NA413 = .5292
	48NA411 = .4931
	48NA414 = .4640
	48NA409 = .4541
	48NA412 = .4363

Figure 3. Ranked Equitibility Measure.

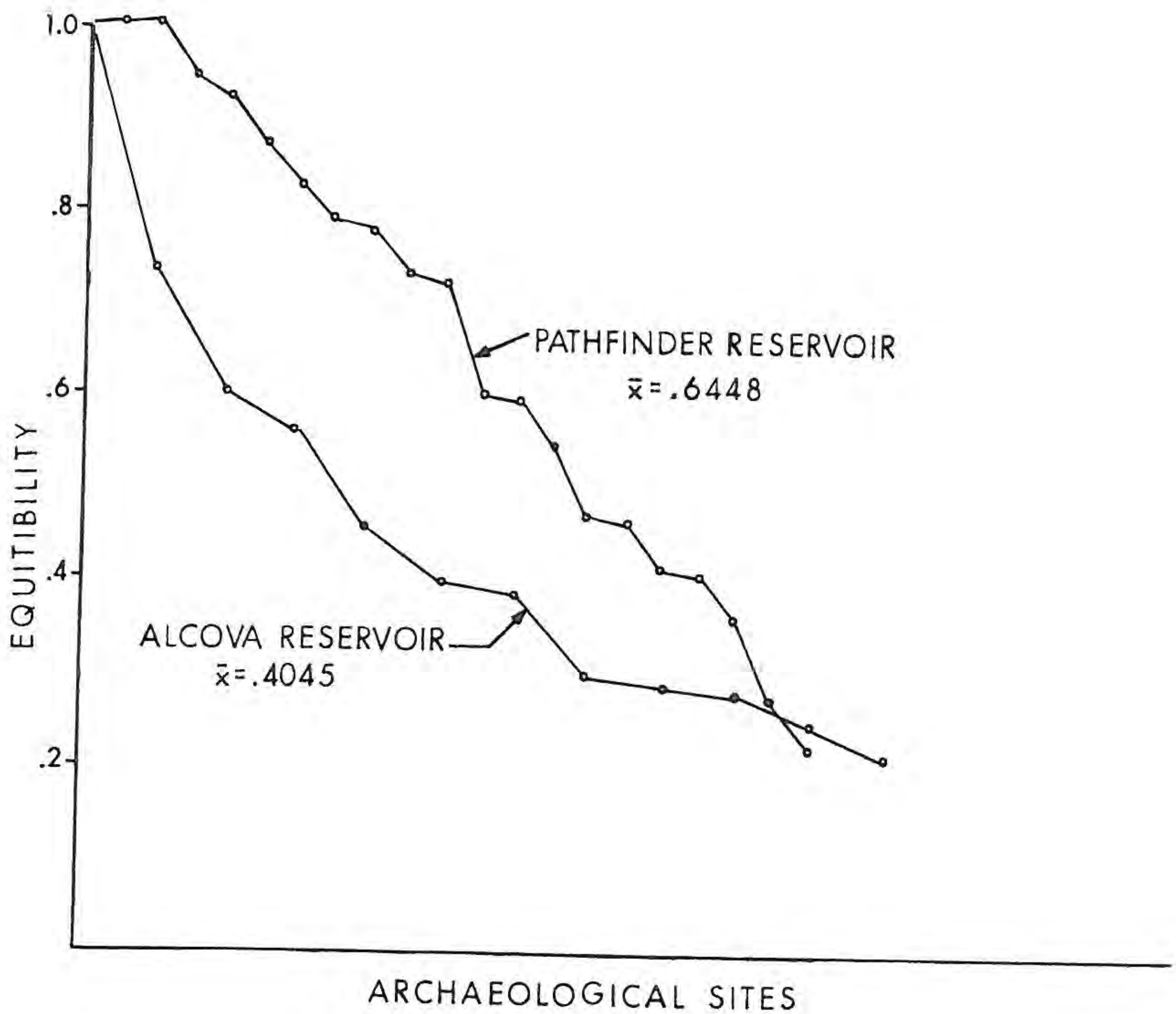


Table 4. Ranked Representation of Artifact Categories.

NUMBER OF SITES REPRESENTED

	NUMBER OF CATEGORIES REPRESENTED											
	1	2	3	4	5	6	7	8	9	10	11	12
ALCOVA $\bar{x}=7.45$				2	2	1	1		1	2	2	
PATHFINDER $\bar{x}=3.95$		6	4	4	1	2	2	1				

Table 1. Site Type Present at Alcova and Pathfinder Reservoirs

Site Type	Alcova	Pathfinder
Large camps	5	2
Single family camps	1	1
Limited activity (hunting)	3	7
Limited activity (core reduction)	2	
Material acquisition		8
Tool Production/Maintenance		1
Undetermined		1

extent than Alcova Reservoir sites. This difference can be partially explained by a comparison of artifact categories. Table 4 shows the number of artifact categories present by site. The mean number of artifact categories present for the Alcova sites is 7.45, while for Pathfinder sites it is 3.95. This clearly suggests that sites from Alcova Reservoir have a greater number of onsite activities taking place compared to the sites from Pathfinder Reservoir; hence, they were more complex (Lincoln n.d.; Carmichael 1977). The intuitive site classification (Table 1) supports these results. Camps represent 55 percent of the Alcova sites, but only 15 percent of the Pathfinder sites; on the other hand, 40 percent of the site types represented at Pathfinder are less complex material acquisition locales, a site type not found at Alcova.

Raw material availability does not appear to be a determining factor for the difference in the number of material acquisition sites. Raw material was available onsite at 55 percent of the Alcova sites and 50 percent of the Pathfinder sites. At Pathfinder, eight of the ten raw material locales were only material acquisition sites while at Alcova such locales were multi-function camp and material acquisition sites.

Raw material usage was also quite different for the two areas even though they are of relatively close proximity. For Pathfinder Reservoir, the majority of raw material present was chert, chalcedony, and quartzite. The material was taken from locally available deposits. At Alcova Reservoir, the major source of raw material was a high quality quartz found around the reservoir and toward the southwest near Fremont Canyon. Quartz artifacts were found at several sites at Pathfinder but in much lower quantities than expected (15 percent when found at Pathfinder as compared to 75 percent at Alcova). At the present time, we are unable to determine why the readily available high quality quartz was not utilized in greater quantities at sites from Pathfinder Reservoir. Possibly differential weathering and exposure of sites is a determining factor.

Chronological indicators were all but lacking from the sites recorded. However, there is evidence from private collections that the project areas were occupied from the Plano through Historic Periods by prehistoric Americans.

Discussion

Even though the results are preliminary, some evaluations can be made from the data available. At Alcova Reservoir, sites are much more complex while there is much less complexity and more specificity at sites from Pathfinder Reservoir. In addition, there is a pronounced differential use of raw material type even though a common source is readily available for both areas. These potential patterns are concerns that will be addressed as the Bureau of Reclamation resumes its surveys of the reservoirs.

REFERENCES CITED

Carmichael, David L.
1977 Premiminary Archaeological Survey of Illinois Uplands and Some Bahavioral Implications. Mid-continental Journal of Archaeology. 2:210-252.

Falk, Carl R. and Robert E. Pepperl
1981 Cultural and Paleontological Resources Investigations Within the Calamus and David Creek Reservoir Areas, Nebraska. Technical Report No. 80-04.

Lincoln, Thomas R.
n.d. Identifying Intrasite Assemblage Variability from Two Lithic Scatters in the Upper Tongue River Valley. Submitted to Archaeology in Montana.

Pielou, E.C.
1975 Ecological Diversity. John Wiley and Sons, New York.

Wood, John J.
1978 Optimal Location in Settlement Space: A Model for Describing Location Strategies. American Antiquity. 43(2):258-270.

SETTLEMENT PATTERNS IN NORTH PARK, COLORADO

by

Joseph J. Lischka

Introduction

In 1977 and 1978, about 25,100 acres of land were surveyed in North Park, Jackson County, Colorado and 151 prehistoric sites were recorded that range from Late Paleoindian to Late Prehistoric in age. An important part of the project was analysis of subsistence and settlement patterns in North Park and how these patterns changed through time. North Park was considered to be an ideal area for this kind of analysis because it is a mountain park surrounded by mountain ranges that limit human movement. It is likely that prehistoric hunters and gatherers who moved into the Park did so in groups that included men, women and children, and stayed there for a period of time, perhaps a season. Once there, all of their activities were probably limited to the Park. Consequently, the sites in North Park should represent complete seasonal settlement patterns. The only activities not represented should be those that left no remains. We also wanted to see if there was any prehistoric winter occupation in North Park. Winters are fairly severe and it is possible that Indian groups move to lower elevations in the winter. However, elk and deer move out of the high mountains into North Park during the winter, which would make the area more attractive for winter occupation.

This paper summarizes the principal results of the North Park settlement study, which is presented in detail in Lischka, et al. (1980).

Research Design

The research design of the North Park settlement study was based on the assumption that the basic determinants of human behavior are economic in nature and that the subsistence and settlement activities of a group involve rational decisions concerning the use of resources and the scheduling of their use. Those decisions were probably based on a combination of circumstances that varied in response to the changing needs of the group, seasonal variations and the kinds of activities that were carried out at the sites. This would be especially true of site locations. A hunting and gathering group trying to decide where to establish a base camp during summer, for example, might consider distance from large and small game habitats, density of wild plant foods in the area, distance from water, numbers of mosquitoes in the area and visibility of the surrounding countryside as relevant factors.

factors. If it were winter, different factors would be important, such as depth of snow and distance from firewood. It follows that analysis of the locations of sites and their relation to various features of the environment should tell us something about the activities that were carried out at the sites.

According to Jochim (1976:15-45), the primary aim of hunters and gatherers in deciding what resources to exploit and when to exploit them are: (1) maintenance of a secure and reliable level of resource input, and (2) expending a minimum of effort in obtaining good tasting foods and a variety of foods, gaining prestige through the pursuit of high risk resources and the maintenance of sex role differentiation. Prestige is gained by pursuing risk-low security resources such as large game. Conversely, obtaining high security resources that are relatively abundant and easy to get gives relatively low prestige. High security foods, according to Jochim, generally include plant foods and small game, and are usually collected by women and children. Hunters and gatherers were attracted to North Park by the abundance of big game there, including deer, elk and antelope. The Ute called North Park the "Cow Pen" because of the bison found there. It is unlikely, however, that Indians would have hunted in North Park without also taking advantage of wild plant foods and small game. If this is so, then their warm season campsites should be located in areas where wild plant foods and small game were most abundant. The campsites would also be located far from big game areas, to avoid spooking the game. Also, dependable sources of water should be located close to campsites. Winter campsites should exhibit different kinds of associations with environmental features. Wild plant foods and small game would not be as accessible in the winter. Big game would gather in snow-free areas where food is more available. The movements of both people and big game would be restricted by deep snows, so winter campsites would tend to be located closer to big game areas than would the warm weather campsites. We would also expect winter campsites to be located in relatively snow-free areas and close to the forested margins of the Park for access to firewood. Closeness to water would not be as important in the winter as it was during the warmer months because snow could be melted for water. Non-habitation sites should not exhibit the same association with environmental features as habitation sites, since their activities would be oriented towards exploitation of different or more specific kinds of resources, or their activities might not be exploitative at all.

Procedures

The prehistoric sites recorded during the North Park Project were grouped into eight categories, based on: (1) the diversity of artifacts found on the sites, (2) the presence or absence of small features such as hearths, and (3) the presence or absence of stone rings, commonly called tipi rings. Sites were classified as limited activity sites if the artifacts found on them represented only one or two artifact classes. If more than two artifact classes were found, the site was classified as a multiple activity site. The eight site categories are defined as follows:

1. Limited activity, no features, no stone rings.

2. Limited activity, features, no stone rings.

3. Multiple activity, no features, no stone rings.

4. Multiple activity, features, no stone rings.

5. Limited activity, no features, stone rings.

6. Limited activity, features, stone rings.

7. Multiple activity, no features, stone rings.

8. Multiple activity, features, stone rings.

Multiple activity sites are thought to represent some degree of habitation, especially if features are present, while limited activity sites are probably specialized activity sites or limited habitation sites, such as overnight campsites. It was also felt that multiple activity sites with stone rings may have been winter campsites, based on the assumption that some sort of shelter would have been necessary in the winter.

Temporally diagnostic artifacts were found on 87 of the 151 prehistoric sites. A total of 61 sites are single component and 26 are multicomponent. The temporally diagnostic artifacts consist primarily of projectile points and these were classified using the Northwestern Plains projectile point sequence (Frison 1978). Five time periods were recognized: Paleoindian, Early Archaic, Middle Archaic, Late Archaic and Late Prehistoric. The relatively large number of sites with diagnostic projectile points enabled us to analyze possible changes in subsistence patterns through time.

To analyze adequately the relation between site locations and environment, it was necessary to define environmental variables that could be quantified. Space does not permit a full description of all of the environmental variables included in the analysis. Some of the environmental variables that showed significant associations include large and small game densities, potential wild plant food densities, distance to water, access to firewood and site overview. The density of big game, small game and potential wild plant foods within ½ kilometer from a site was calculated using information supplied by the Soil Conservation Service. Distance to water and firwood was obtained from USGS topographic maps. Site overview was calculated by measuring the degree of unobstructed view from a site. Large and small game distributions and plant cover have undoubtedly been affected by historic occupation, but the Soil Conservation Service data are derived from an assessment of range conditions as they existed prior to Euroamerican occupation. A more serious problem with the use of the environmental data is the probability that changing climatic conditions over the past 10,000 years have caused changes in fauna and vegetation. The possibility of environmental changes must be kept in mind when evaluating the results of the site locational analysis.

Analysis of the associations between site categories and environmental variables was conducted using all of the 151 prehistoric sites. F and T statistical tests were conducted, using the appropriate SPSS programs, to determine if there were significant differences in environmental variables over time. The analysis of temporal variation was conducted only on the 61 sites with one dated component. The multi-component sites were excluded from the temporal analysis to maintain more control over the temporal variable.

Results

The settlement analysis showed several significant associations between the site categories and specific environmental variables. Multiple activity sites with features tend to be located close to water sources and in areas with high small game and wild plant food densities. This supports the hypothesis that these sites are base camps and the predicted association of base camps with high security resources. Big game densities in the vicinity of these sites are low, which supports the hypothesis that warm weather base camps would be located some distance from big game ranges.

Multiple activity sites with features and stone rings were tentatively identified as winter base camps. The statistical analysis shows that these sites tend to be located at higher elevations some distance from water and in areas with high big game and low small game densities. The two sites with the greatest number of stone rings are located less than 2 kilometers from the highest winter concentrations of elk and deer in North Park and are near forested areas. These findings conform with the expected locational pattern for winter habitation sites. The sites also tend to be located on ridges and south-facing slopes that are generally free of snow in the winter. This leads to the prediction that multiple activity sites with features and stone rings will be found in the same type of location in other parts of North Park. This does not mean, however, that all stone rings represent winter shelters. Several sites with stone rings were recorded that lacked either associated artifacts or features and which did not exhibit the same kinds of environmental associations. Some may be the remains of hunting blinds and others may have been associated with certain kinds of ceremonial activities, such as vision quest.

Limited activity sites without features or stone rings did not have positive associations with any of the environmental variables. Potential wild plant food gathering activities were quite low, indicating that primary food gathering activities were not carried out at these sites.

There was little change from period to period in the association of environmental variables with site locations, except for a possible emphasis on small game during the Early Archaic, which might relate to possible reductions in big game during the Altithermal. The high small game densities indicated for Early Archaic sites, however, may be due to chance variation. Either there was little change in subsistence activities through time, or environmental changes have obscured whatever changes in subsistence activities may have occurred.

This study should not be taken as a definitive study of hunter-gatherer settlement patterns in North Park. The areas surveyed only comprise a small percentage of the total area of the Park and are not a representative sample of environmental zones. The study, however, provies a basis for future research.

REFERENCES CITED

Frison, George
1978 Prehistoric Hunters of the High Plains. Academic Press, New York.

Jochim, Michael A.
1976 Hunter-Gatherer Subsistence and Settlement: A Predictive Model. Academic Press, New York.

Lischka, Joseph, Mark E. Miller, R. Branson Reynolds, Dennis Dahms, and Kathie Joyner-McGuire
1980 A Class III Cultural Resources Inventory of Potential Coal Production Areas in North Park, Jackson County, Colorado. Unpublished manuscript on file in Craig District Office of the Bureau of Land Management.

PREHISTORIC SETTLEMENT PATTERN ANALYSIS OF A PORTION OF THE HANNA BASIN, WYOMING

by

David Reiss

Abstract

Prehistoric Settlement Pattern Analysis of a Portion of the Hanna Basin, Wyoming

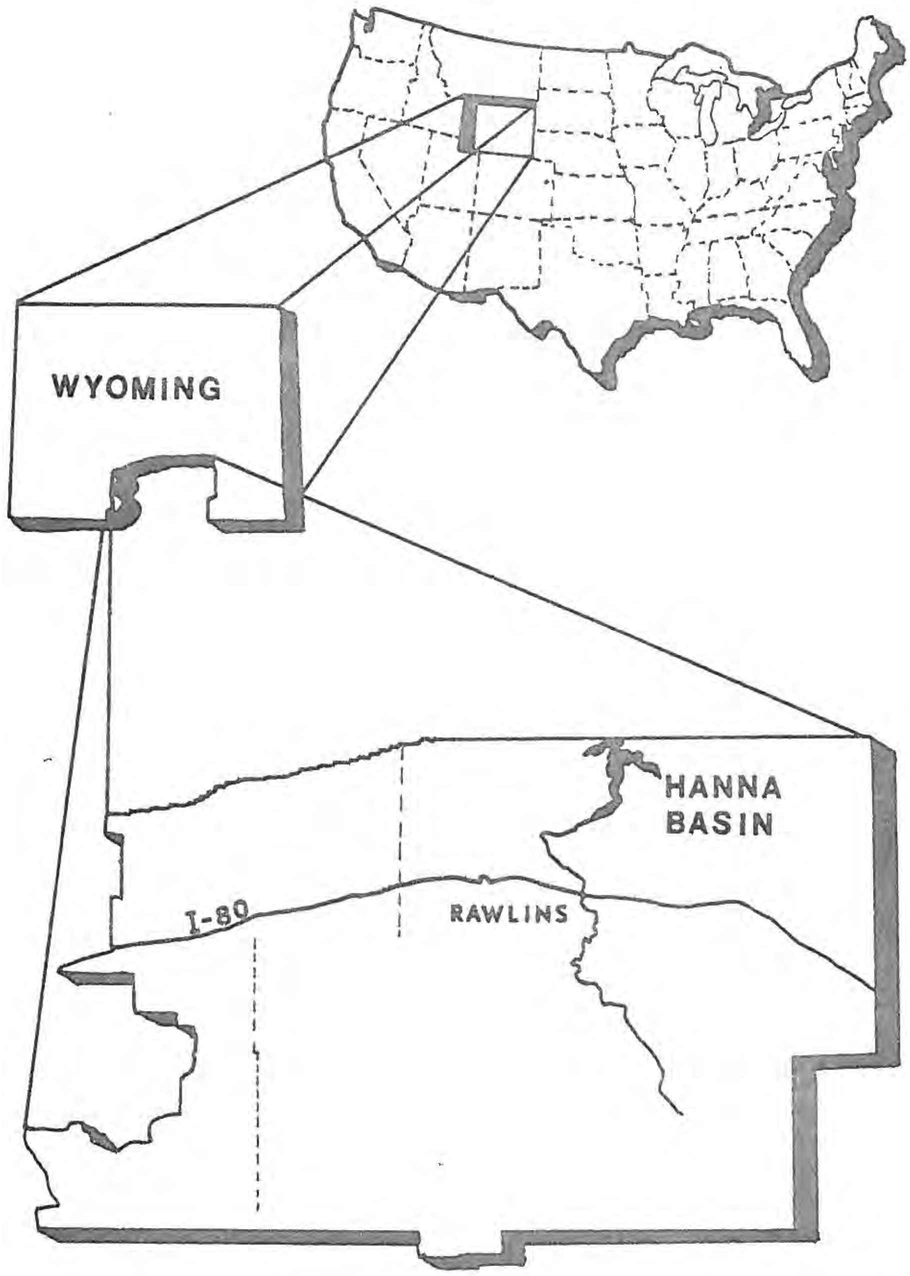
This analysis, compiled from cultural resource management studies, examines prehistoric settlement patterns within a portion of the Hanna Basin. Site types were grouped by calculating the diversity indices of the lithic materials from 82 sites located in the area. These site types were correlated with environmental and site attribute variables. These same variables were correlated with site types grouped by temporal similarities. The findings suggest a change in settlement patterns between the Archaic sites and the Late Prehistoric sites within the study area.

The purpose of this analysis is to relate specific environmental features to archeological site locations, site function, and temporal affiliations.

The Hanna Basin, located in south-central Wyoming was chosen for the study because of the availability of several cultural resource management inventories. These have been conducted since 1977 for various coal mines. In addition, all of the lithic artifacts from the study area have been collected and are available for analysis. The main limitation of this research is that the area of investigation covers only a small portion of the Hanna Basin. This area does not represent the total amount of environmental diversity which is present in the Basin and, therefore, will represent only a small segment of the total settlement pattern.

The Hanna Basin is a portion of the North Platte River Valley (Figure 1). The Basin is bordered on the north by the Shirley, Freezeout and Seminoe Mountains. The Medicine Bow Mountains border the Basin to the south. Elk Mountain is one of the most prominent features in this range with an elevation of 11,162 feet.

The study area covers 15,000 acres and is located on the eastern edge of the North Platte River (Figure 2). The Big Ditch and St. Mary's Creek flow through the area and empty into the North Platte River. Numerous ephemeral drainages flow into the



(Adopted from Department of Interior 1978)

Figure 1: Regional Map of the Hanna Basin.

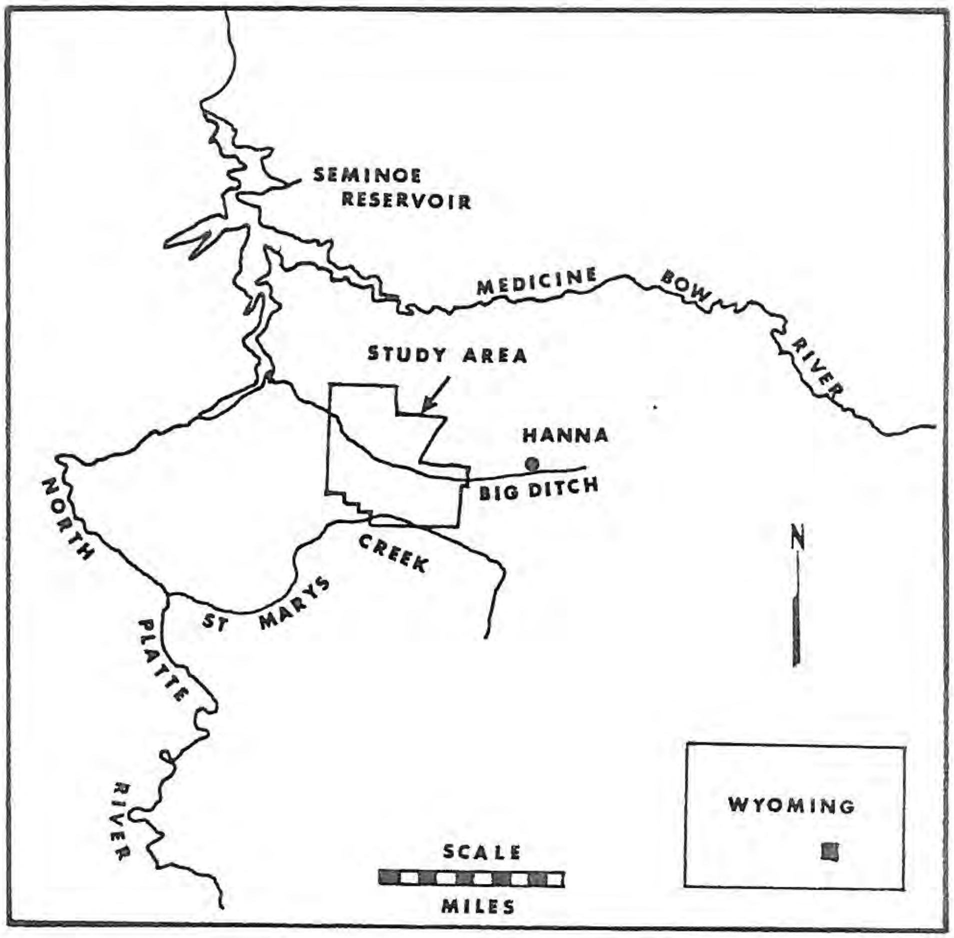


Figure 2: Map of the Study Area.

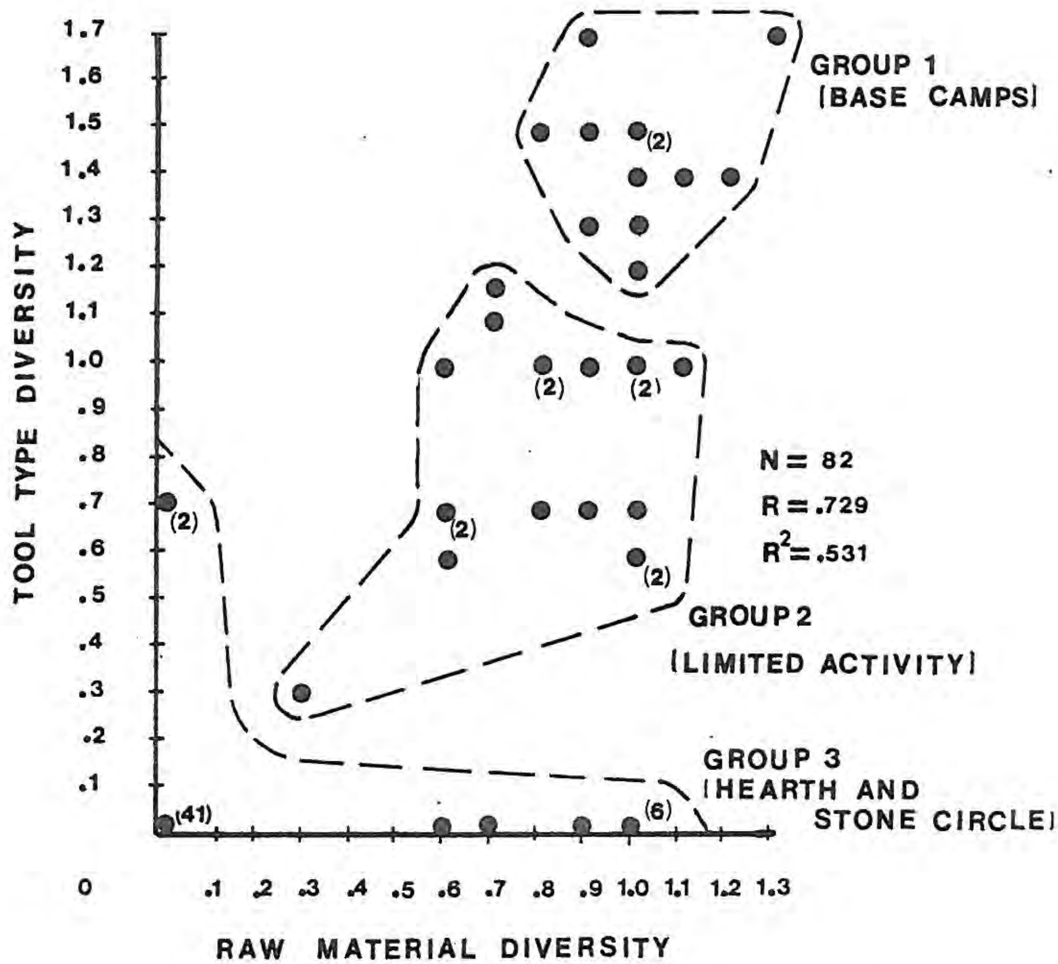


Figure 3: Bivariate Plot of Diversity Indices.

Big Ditch and St. Mary's Creek. Elevation ranges from 6000 to 7000 feet. Three broad vegetation communities, bottomland greasewood-sagebrush, upland sagebrush, and grassland occur in the area. There are fourteen known edible plants within these communities and these probably provided a good economic base for prehistoric populations. In addition, the North Platte River could have provided a source of permanent water, a lithic raw material source in the form of river cobbles and may have served as a seasonal transportational route.

The sites in the study area consist of lithic artifacts, stone circles, groundstone, and numerous fire hearths. Few sites have faunal remains. It appears that the area was used as a seasonal occupation perhaps mainly for foraging activities. This assumption is based on the diversity, the abundance of groundstone and fire hearths, and the relative lack of recovered faunal material. This is not to suggest that hunting did not occur in the area, but the archeological evidence indicates a substantial reliance on foraging activities.

Site function is a critical factor in any settlement pattern analysis. Aboriginal hunter-gatherers are assumed to have resided in two basic kinds of sites, base camp and limited activity sites. In this case, intersite variation was analyzed by calculating the tool and raw material assemblage diversities of each site. Assemblage diversities were calculated using the Shannon-Weaver formula, a calculation that weighs both the number and evenness of the variables (Reher and Frison 1977:8).

$$H' = -\sum_{i=1}^{n} p_i \text{Log } p_i$$

n=the minimum number of tool or raw material types,
p=the percentage contribution of each tool or raw material type i.

It is generally assumed that base camps will reflect a wide range of cultural activity while limited activity sites will reflect a more restricted range of cultural activities. Therefore, base camps should have the most diverse artifact assemblages while that of limited activity sites would be less diverse. There are, of course, problems with this model, such as the possibility of reoccupation of certain sites or that even one activity may result in the use of several tool types and raw materials. However, in a band level hunting and gathering subsistence pattern, this model may be expected to hold as a general rule (Reher 1979: 247).

Diversity indices were calculated for 82 sites, a 75% sample of the sites in the study area. Both raw material and tool type assemblage diversities were calculated. These diversity indices were diagrammed on a bivariate plot and Pearson's correlation

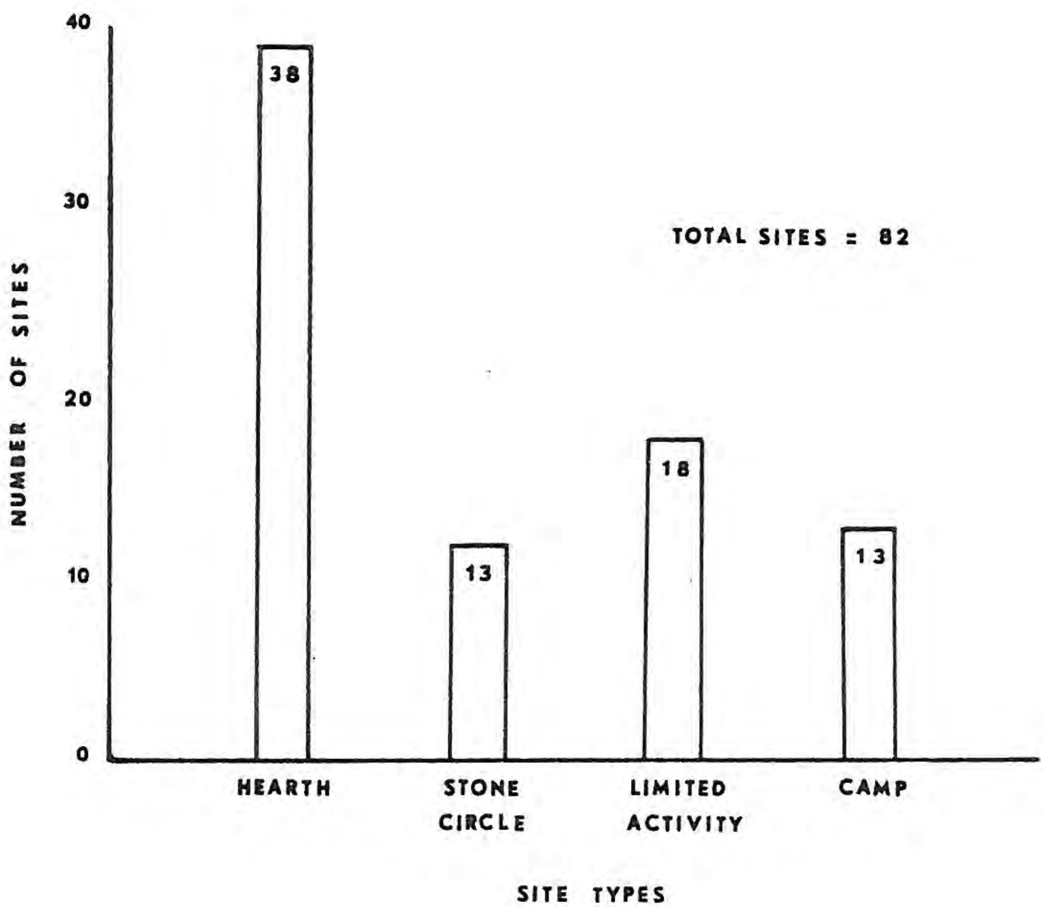


Figure 4: Number of Sites In Each Site Type.

VARIABLE		CAMP SITES	HEARTH SITES	LIMITED ACTIVITY SITES	STONE CIRCLE SITES
ELEVATION (METERS)	MEAN	2071	2056	2073	2079
	SD	40	33	36	42
	NUMBER	13	38	18	13
SITE AREA (SQ M)	MEAN	14477	1508	2911	733
	SD	15890	2748	2803	1110
	NUMBER	12	30	12	10
DISTANCE TO DRAINAGE (METERS)	MEAN	180	143	213	180
	SD	171	91	201	141
	NUMBER	13	38	18	13
DISTANCE TO MAJOR DRAINAGE (METERS)	MEAN	1477	1164	1407	1572
	SD	734	866	872	797
	NUMBER	13	38	18	13

Table 1: Results of the Continuous Variables by Site Type.

VARIABLE	CAMPSITES		HEARTH SITES		LIMITED ACTIVITY SITES		STONE CIRCLE SITES	
PERCENTAGES	Present	Absent	Present	Absent	Present	Absent	Present	Absent
PROJECTILE POINTS	92	8	13	87	67	33	8	92
GROUND STONE	62	38	21	79	56	44	15	85
FIRE HEARTHS	100	0	100	0	94	6	23	77

Figure 5: Results of the Dichotomous Variables By Site Type.

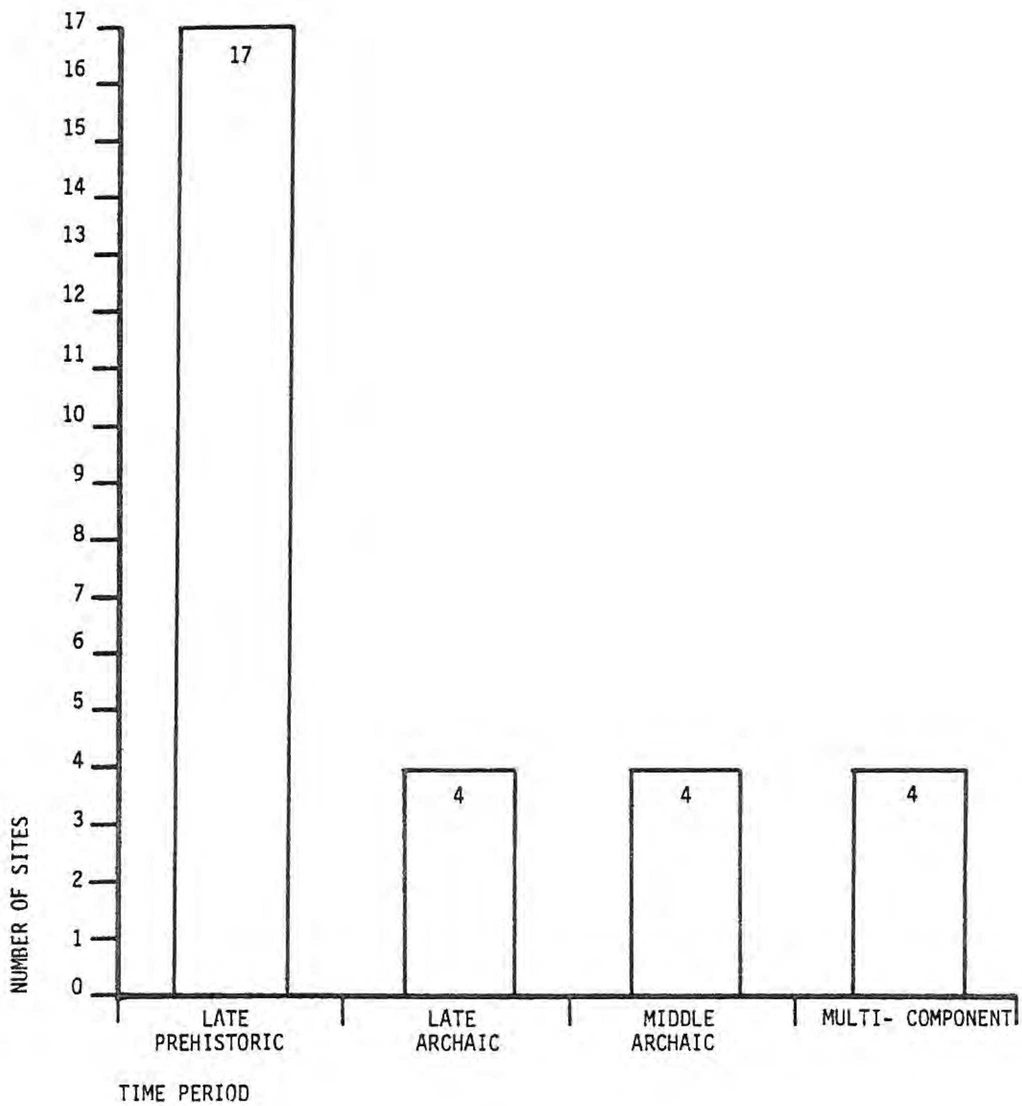


Figure 6: Number of Sites In Each Time Period.

coefficient was calculated. The correlation between tool and raw material assemblage diversities is significant at the .05 level and confirms the visual impression of a strong positive correlation. Sites were groups visually into three clusters (Figure 3). Group 1 has the highest assemblage diversities and thus, probably represents base camps. Group 2 has moderate assemblage diversities and probably represents limited activity sites. Group 3 has low assemblage diversities and is represented by fire hearth sites and stone circle sites. These sites were generally not associated with lithic materials. When lithic materials were present at these sites, the diversity indices were low. These groupings are preliminary, but they should be testable through additional settlement analysis.

The majority of the sites analyzed in this study are classified as hearth sites. Limited activity sites are less numerous. An equal number of camp and stone circle sites occur (Figure 4). Both are the least frequent site type.

Four site attributes were selected to further examine the activities taking place at a site. These were: 1) the presence or absence of projectile points, 2) the presence or absence of ground stone, 3) the presence or absence of fire hearths, and 4) the total site size or area. Dichotomous coding had to be used for most of these categories because in many cases the exact numbers of these attributes located on each site could not be determined from the original reports and field notes. In some cases the exact size of the site could not be determined.

Three environmental features were selected to test their influence on site locations. These were: 1) the elevation of the site, 2) the distance from the site to an intermittent drainage such as the ones which feed into the Big Ditch or St. Mary's Creek, and 3) the distance from the site to a major drainage such as the Big Ditch or St. Mary's Creek. These continuous variable measurements were taken from United States Geological Survey topographic maps.

The means and standard deviations were calculated for all of the continuous variables by site type. Percentages were calculated for the dichotomous variables by site type.

The results of the calculations for the continuous variables indicate that the hearth sites tended to be located at lower elevations than the other sites (Table 1). Camp sites have a relatively large mean site area and the stone circle sites have the smallest mean site area. The large standard deviations in all of these categories suggest that there is a considerable amount of variation in the site size within each site type. Hearth sites appear to be situated closer to intermittent drainages than the other site types, but the large standard deviations indicate a wide range within this variable. The hearth sites also appear to be situated closer to a major drainage than the other site types. This variable correlates well with the variable of elevation since the major drainages are at lower elevations than the rest of the study area.

The results of the calculations for the dichotomous variables indicate that campsites and limited activity sites generally have projectile points, ground stone, and fire hearths present while hearth sites and stone circle sites lack projectile points and groundstone (Figure 5). The results of this analysis tend to support the assumption that more activities were conducted at base camps than at the other sites.

The function of stone circle sites is problematic on the Northwestern Plains. Some investigators refer to them as "tipi rings". They argue that the stones were used to hold down the skin of a conical lodge or tipi (Kehoe 1960). Other researchers argue that they do not resemble habitation sites due to the lack of artifacts, fire hearths, storage pits and floors (Wormington and Forbis 1965). The evidence from this study suggests that they were not habitation sites for the reasons stated above. However, this evidence is based only on surface remains. It is strongly recommended that more of these sites be subjected to rigorous examination to determine their function.

In order to examine changes in the settlement pattern over time, the dated sites were grouped by their temporal time period (Figure 6). Frison's (1978) cultural chronology of the Northwestern Plains was used. The small sample of Late and Middle Plains Archaic sites necessitated the combining of the Archaic sites. The same continuous variables analyzed for all site types were used here. Sites within each type were divided into Late Prehistoric, Archaic, and Unknown temporal categories. Multi-component sites, representing different time periods were not included in this analysis.

The results of this analysis should be regarded as tentative because of the small sample (Tables 2-5). Based on his settlement pattern work in the Corral Creek area located a few miles west of the current study area, Miller (1979) suggests that apparently there was a difference in settlement patterns between the Archaic and the Late Prehistoric Periods. He further hypothesized that there was a shift in site location from one drainage to another between the Late Plains Archaic and the Late Prehistoric Periods (Miller 1979:86). Some data from this study tends to support his findings. Hearth sites and limited activity sites are the only site types from this study with a large enough sample size to be minimally comparable temporally. Miller uses base camps in his analysis and so his data may not be completely comparable to the data here. However, both hearth and limited activity sites appear to be located farther away from a major drainage during the Archaic Period than during the Late Prehistoric (Tables 2 and 3). This may indicate that groups were exploiting smaller

HEARTH SITES				
VARIABLE	LATE PREHISTORIC	ARCHAIC	UNKNOWN PERIOD	ALL SITES
ELEVATION (METERS)				
MEAN	2048	2075	2053	2056
SD	20	25	33	33
NUMBER	5	3	29	38
SITE AREA (SQ M)				
MEAN	1822	3182	1290	1508
SD	2837	551	2957	2748
NUMBER	4	3	22	30
DISTANCE TO DRAINAGE (METERS)				
MEAN	198	50	154	143
SD.	221	23	92	91
NUMBER	5	3	29	38
DISTANCE TO MAJOR DRAINAGE (METERS)				
MEAN	898	2021	1098	1164
SD	411	1068	879	866
NUMBER	5	3	29	38

Table 2: Results of the Continuous Variables on Hearth Sites Grouped By Time Period.

LIMITED ACTIVITY SITES				
VARIABLE	LATE PREHISTORIC	ARCHAIC	UNKNOWN PERIOD	ALL SITES
ELEVATION (METERS)				
MEAN	2067	2068	2061	2073
SD	32	34	41	36
NUMBER	4	4	8	18
SITE AREA (SQ M)				
MEAN	2282	5040	1585	2911
SD	1305	4118	1000	2803
NUMBER	3	4	5	12
DISTANCE TO DRAINAGE (METERS)				
MEAN	179	58	258	213
SD	140	32	168	201
NUMBER	4	4	8	18
DISTANCE TO MAJOR DRAINAGE (METERS)				
MEAN	1554	1776	1178	1407
SD	749	683	1119	872
NUMBER	4	4	8	18

Table 3: Results of the Continuous Variables on Limited Activity Sites Grouped by Time Period.

CAMP SITES				
VARIABLE	LATE PREHISTORIC	ARCHAIC	UNKNOWN PERIOD	ALL SITES
ELEVATION (METERS)				
MEAN	2069	2060	2102	2071
SD	33	0	29	40
NUMBER	6	1	3	13
SITE AREA (SQ M)				
MEAN	13260	5544	1997	14477
SD	10991	0	158	15890
NUMBER	5	1	3	12
DISTANCE TO DRAINAGE (METERS)				
MEAN	198	30	249	180
SD	221	0	167	171
NUMBER	6	1	3	13
DISTANCE TO MAJOR DRAINAGE (METERS)				
MEAN	1444	2600	1777	1477
SD	634	0	318	734
NUMBER	6	1	3	13

Table 4: Results of the Continuous Variables on Camp Sites Grouped by Time Period.

STONE CIRCLE SITES				
VARIABLE	LATE PREHISTORIC	ARCHAIC	UNKNOWN PERIOD	ALL SITES
ELEVATION (METERS) MEAN	2042	0	2082	2079
SD	51	0	39	42
NUMBER	2	0	10	13
SITE AREA (SQ M) MEAN	2409	0	315	733
SD	793	0	466	1110
NUMBER	2	0	8	10
DISTANCE TO DRAINAGE (METERS) MEAN	120	0	183	180
SD.	155	0	149	141
NUMBER	2	0	10	13
DISTANCE TO MAJOR DRAINAGE (METERS) MEAN	1229	0	1670	1572
SD	1172	0	805	797
NUMBER	2	0	10	13

Table 5: Results of the Continous Variables on Stone Circle Sites Grouped by Time Period.

drainages during this period. Miller also suggests that the site size of base camps decreases in the Late Prehistoric Period (1979:90). The hearth and limited activity sites analyzed in this study also decrease in size during the Late Prehistoric Period (Tables 4 and 5).

These apparent settlement changes are difficult to explain. One possible explanation for the location of Archaic sites away from major drainages is that the climate may have been wetter during this period. If this were the case, there may have been less need to locate near major drainages as there may have been enough water and vegetative resources in the smaller drainages.

In order to test the relative wetness of the climate during the Archaic Period, the paleo-environment of the area could be reconstructed from various types of studies conducted on well-preserved sites in the area. These studies could include archeobotanical and faunal analyses. The Scoggins site (Lobdell 1973), the Shoreline site, and a number of other buried sites in the area could be utilized for these studies.

Miller speculates that the decrease in site size during the late Prehistoric Period may have been due to a population increase. Based on this, one might expect larger base camp sites or more of them, however, his data does not indicate this (Miller 1979: 92). The present study does suggest the existence of more Late Prehistoric camp sites than Archaic camp sites (Table 2). Unfortunately, there are not enough Archaic campsites in the sample to compare the site size to the Late Prehistoric camp site size.

There are a number of cultural resource surveys which have been conducted on areas adjacent to the study area. The data from these other sites could be used to test hypotheses concerning the changes in settlement patterns through time in addition to other anthropological research problems.

REFERENCES

Department of Interior, 1978, Development of Coal Resources in South-Central Wyoming, Draft Environmental Statement, Vol. 1, Washington, D.C.

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

Kehoe, Thomas F., 1960, Stone Tipi Rings in North-Central Montana and the Adjacent Portion of Alberta, Canada: Their Historical Ethnological and Archaeological Aspects, Bureau of American Ethnography, Bulletin, 173:421-473.

Lobdell, John E., 1973, The Scoggin Site: An Early Middle Period Bison Kill, M.A. Thesis (Anthropology), University of Wyoming, Laramie.

Miller, Mark, 1979, Draft Final Report of a Cultural Resources Inventory of the Corral Creek Coal Production Project in South-Central Wyoming, unpublished.

Reher, C.A., 1979, The Western Powder River Basin Survey, Vol. I-III, Unpublished report on file at the Office of the Wyoming State Archeologist, Laramie.

Reher, C.A. and G.C. Frison, 1977, Territorial Inference from Source Analysis of Lithic Assemblages, Paper presented at the 42nd Annual Meeting of the Society for American Archaeology Meetings, New Orleans.

Wormington, H.M. and Richard G. Forbis, 1965, An Introduction to the Archeology of Alberta, Canada, Denver Museum of Natural History, Proceedings, No. 11, Denver.

CONTINUING INVESTIGATIONS AT THE JOHN GALE SITE NEAR RAWLINS, WYOMING

by

Mark E. Miller

Introduction

The John Gale Site (Brox and Miller 1974), discovered in 1936 by W.A. Brox, is located approximately two miles west of Rawlins and lies adjacent to Cherokee Springs in the Rawlins Uplife at an elevation of 7140 feet (2,176m). This site and the Garrett Allen or Elk Mountain site provide the most complete stratigraphic records for prehistoric occupation near the North Platte River in southern Wyoming.

The site environment, as is the case with most of the Wyoming Basin, consists of vegetation characteristic of the Sagebrush Steppe zone (Kuchler 1964). Chokecherry (Prunus demissa) and Serviceberry (Amelanchier sp.) are prevalent, but stands of Box Elder (Sambucus sp.) have been destroyed through limestone quarrying on nearby ridges. Topographic relief generated by the Rawlins Uplife projects a contrast to the general monotony of the basin landscape and provides site protection from prevailing southwesterly winds.

The Wyoming Basin extends between the Central and southern Rocky Mountains and encompasses the area between the North Platte and Green Rivers (Vass and Lang 1938). Mulloy (1958) identified this area as a corridor between the Plains and Great Basin and speculated that it would be the easiest route for prehistoric interaction between these two culture areas. Archaeological data at John Gale support Mulloy's expectation.

History of Investigations

Initial excavations were undertaken in 1974 when George Brox discovered subsurface material exposed in disturbed areas along the drainage channel. A 10' x 10' trench was opened, but soon was reduced to a 5' x 10' trench due to the high density of artifacts in the upper levels. More of the original trench was excacated in 1975. The 1974 test excavation utilized 6" arbitrary levels to a total grid to metric, and a 1 x 2 meter trench was excavated using natural and cultural levels to a depth of 1.3 meters below the surface. Although a plane table map has not been made of the site, these excavations undoubtedly represent less than one percent of the total surface area (Fig. 1). Bedrock has not been exposed in any of the excavations.

Stratigraphy and Chronology

Excavation in 1974 revealed three separate cultural levels believed to be Late Prehistoric in age. The 1978 excavation indicates that there may be as many as five separate levels for this period. Each of these are separated by sterile sandy deposits laid down either by wind or stream action (Fig. 2).

There was an accumulation of large, angular rocks and debris over the site sometime before Late Prehistoric occupation and after Late Plains Archaic occupation. This depositional unit is approximately 65cm thick. Currently, it is believed to represent a landslide or talus accumulation from the nearby ridges rather than fluvial deposition. The angular nature of the stones and lack of pronounced size sorting of debris fragments support this contention, but final identification is impossible until a Holocene stratigrapher has studied the depositional sequence. A large corner-notched dart point was found directly beneath this unit in the 1975 test. It is believed to be Late Plains Archaic in age and represents the oldest temporal type found in context at John Gale to date.

Excavations were terminated in all test units at this level. The final stage of the 1978 excavation season was to clean up the west profile of a backhoe trench excavated by the landowner approximately 15 meters upstream. Although the stratigraphy here is less distinct, there is evidence of multiple cultural levels above a rocky unit and multiple cultural levels below it (Fig. 3).

Four obsidian hydration dates on artifacts collected during the 1978 season confirm the Late Prehistoric age of the top two levels at the site. The bottom three levels, just above the rocky unit, are suspected to be Late Prehistoric because of their artifact assemblages and stratigraphic positions. One obsidian hydration date below the rocky unit in the backhoe trench, at 1.75 meters below the surface, indicates a Late Plains Archaic occupation. Two provisional hydration rates were used by Les Davis in his analysis of the obsidian artifacts due to the lack of samples from southern Wyoming. The first, a 4.6 microns squared/1000 years, rate applies to the Northern Wyoming Basin and is taken from Davis' dissertation. A 5.2 rate provides an incremental increase in hydration rate to account for the John Gale site's position in Southern Wyoming. Consequently, the Late Plains Archaic occupation may date in the vicinity of 840 B.C. (2790 B.P.) to 520 B.C. (2470 B.P.) (P3054).

The most recent Late Prehistoric cultural level probably dates between A.D. 1520 (430 B.P.) (P3055) and A.D. 1610 (340 B.P.) (P3058). Level two dates between A.D. 1420 (530 B.P.)

(P3059) and A.D. 1480 (470 B.P.) (P3059). Although obsidian dates are still speculative, they provide a baseline for analysis until radiocarbon dates are obtained. These hydration dates and the presence of the rocky unit have made it possible to correlate the stratigraphy in the 1974 and 1978 tests with the backhoe trench upstream with some degree of confidence.

Faunal Assemblage

At least 7 different animal species are represented in the faunal assemblage at John Gale and most if not all are probably related in some way to the cultural activities at the site. This list includes (1) bison (Bison bison), (2) antelope (Antilocapra americana), (3) Ground Squirrel (cf. Citellus lateralis), (4) Northern Pocket Gopher (Thomomys talpoides), (5) Rabbit (family leporidae), (6) a canid probably coyote, and (7) teeth possibly from a Mountain Sheep (Ovis sp.). The bone element inventory attests to the diverse resources available to the inhabitants and indicates a possibly equally diverse diet.

Butchering patterns on the bison elements are reminiscent of the Glenrock buffalo jump (Frison 1970). The frequency of articulated humerus-ulna-radius units and isolated elements indicate an emphasis on foreleg units in the faunal assemblage. This could represent a dietary preference or may indicate that the test excavations center on a localized butchering or discard area. However, once more of the site is excavated the proportion of front leg elements will probably change. At least four bison are present from the test excavations. Fractures on antelope bone elements are similar to those on the bison, a pattern recognized at Eden Farson (Frison 1971).

Some butchered, articulated units of bison are fairly large and would have been heavy when meat was still attached. The best example is ten articulated vertebrae which include the last five thoracic and the five lumbar. This vertebral column, the frequency of other articulated units and the quantity of fragmented bison bone suggest a heavy butchering load and therefore close proximity to an associated kill site (cf. Kehoe 1967). To transport some of these butchered elements long distances would have been difficult. The mandible sample is too small to speculate on the season of site occupation.

Botanical Analysis

Lorraine Dobra (personal communication 1979) of the University of Colorado has identified botanical remains collected from two of the Late Prehistoric cultural levels. Charred and uncharred seeds of goosefoot (Chenopodium sp.) and a charred seed of saltbush (Atriplex patula) were found. Seeds from both of these genera are edible and ethnographic research on North American

Indians indicates that they were utilized by some groups (Yanovsky 1936). Both faunal and floral analyses provide evidence to support the possibility that the occupants of the John Gale site employed a broad spectrum hunting and gathering, or foraging, subsistence strategy. Further dietary clues may emerge when analysis of charred residue scraped from several of the pottery sherds is completed.

Lithic Anaysis

A diverse inventory of stone tool types has been recovered to date, and this indicates a multi-functional artifact assemblage. Such evidence tempts one to suggest that the John Gale site is a base camp, having been intermittently used by several families for extended periods of time. Unfortunately, excavations have failed to reveal any definite features or definable activity areas. In fact, the stratified cultural levels may represent only the accumulation of a trash midden adjacent to the stream.

The stone artifact assemblage provides clues to manufacturing stages of artifacts and illustrates the diversity of raw material types. An overall lack of cortex flakes in all material types suggests initial core reduction was performed elsewhere. Material types appear to be of both local and nonlocal materials, apparently from location both to the east and west. Quartzite, chalcedony and a brown chert from the Red Desert region comprise the majority of the flake assemblages.

Ceramic Assemblage

John Gale exhibits one of the most diverse ceramic assemblages of any site in Wyoming. At least three and probably many more vessels are represented. Certainly, more will be known if the ceramics collected by the landowner are returned for analysis. Two types of fingernail incisions, at least three different types of rim profiles, and firing in both oxidizing and reducing atmospheres are present. Most sherds analyzed exhibit a quartz sand temper which may be of local origin, and this argues for an on site manufacturing process.

The most complete vessel exhibits several attributes characteristic of Crow ceramics (Brox and Miller 1974: Figs. 13 & 14). This vessel is evenly tempered, well fired, exhibits a shoulder, and probably had a rounded base. Obsidian dates for levels one and two compare favorably with Crow manifestations in northern Wyoming. This further indicates potential Basin and Plains interaction. Another vessel, burned quite black and exhibiting an irregular pattern of fingernail impressions (Brox and Miller 1974: Fig. 11 lower right) has been identified by at least one archaeologist (William Mulloy, personal communication 1974) as possibly Promontory. Intermountain wares also may be present in the sherd inventory, although no flat basal sherds have been found.

Conclusions

Preliminary investigations and stratigraphic correlations at John Gale indicate what appears to be a large multicomponent base camp occupied periodically at least between 800 B.C. and A.D. 1610. Since bedrock has not been reached, it is likely that earlier components exist. Subsistence activities, lithic raw material types, ceramic artifacts and the geographical location of the site argue for its context in a regional interaction sphere between the Plains and Basin culture areas. Upper levels at the site may be of Shoshonean affiliation but Crow traits are present in ceramics. Future investigations will be organized around the implications that the theory of a prehistoric interaction sphere places on the activities at the John Gale site.

REFERENCES CITED

Brox, George and Mark Miller
1974 The John Gale Site 48CR303: A Preliminary Report. Wyoming Archaeologist, Vol. 17, Pp. 13-26.

Dobra, Lorraine
1979 Personal Communication. University of Colorado. Boulder.

Frison, George C.
1970 The Glenrock Buffalo Jump, 48CO304: Late Prehistoric Buffalo Procurement and Butchering on the Northwestern Plains. Plains Anthropologist, V. 15, No. 50, pt. 2 Memoir No. 7.

1971 Shoshonean Antelope Procurement in the Upper Green River Basin, Wyoming. Plains Anthropologist, V. 16, No. 54, pt. 1.

Kehoe, Thomas
1967 The Boarding School Bison Drive Site. Plains Anthropologist, V. 12, No. 35.

Kuchler, A.W.
1964 Potential Natural Vegetation of the Coterminous United States. American Geographical Society. Special Publications, No. 36.

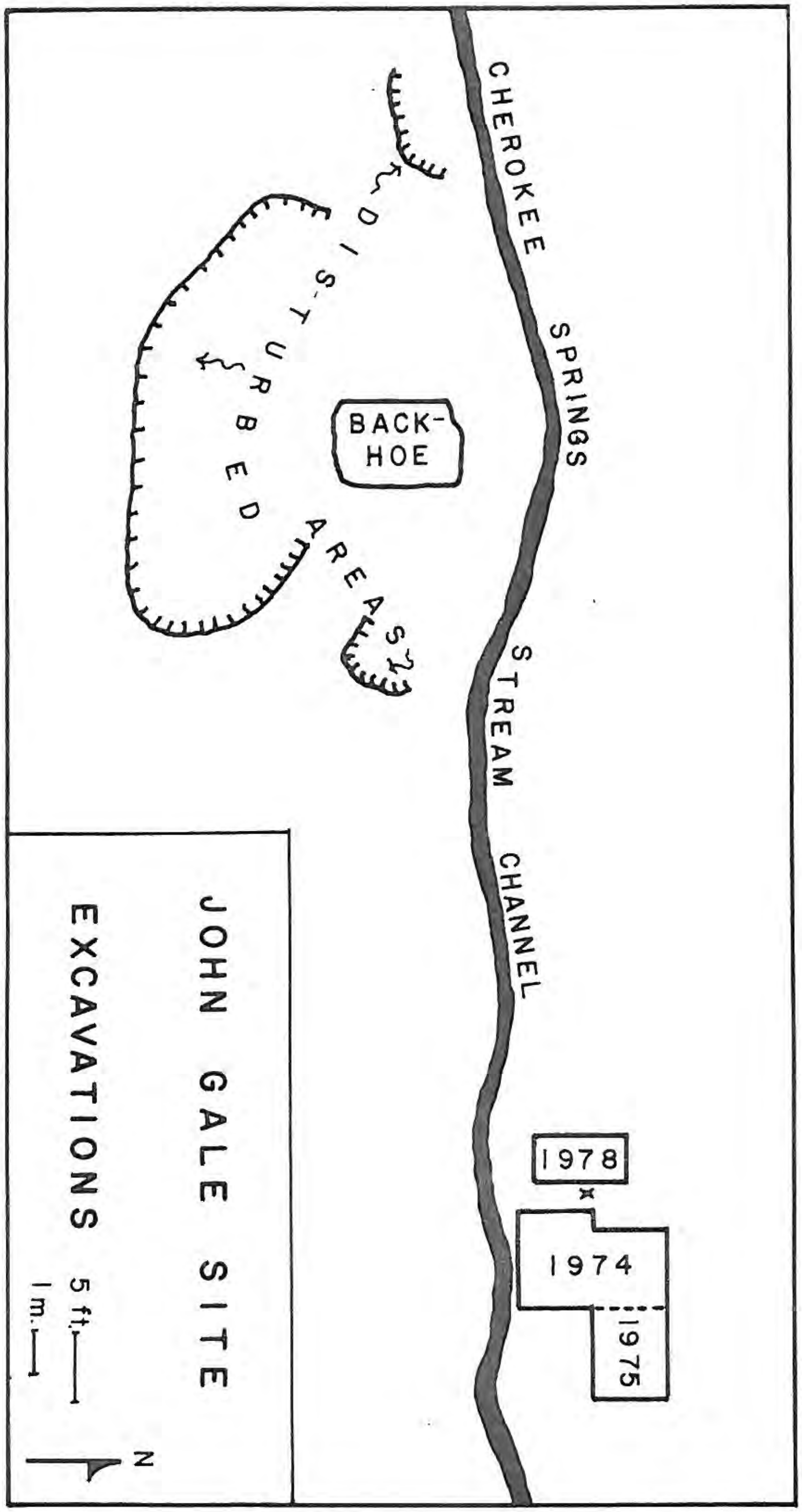
Mulloy, William
1958 A Preliminary Historical Outline for the Northwestern Plains. University of Wyoming Publications, V. XXII, No. 1:199.

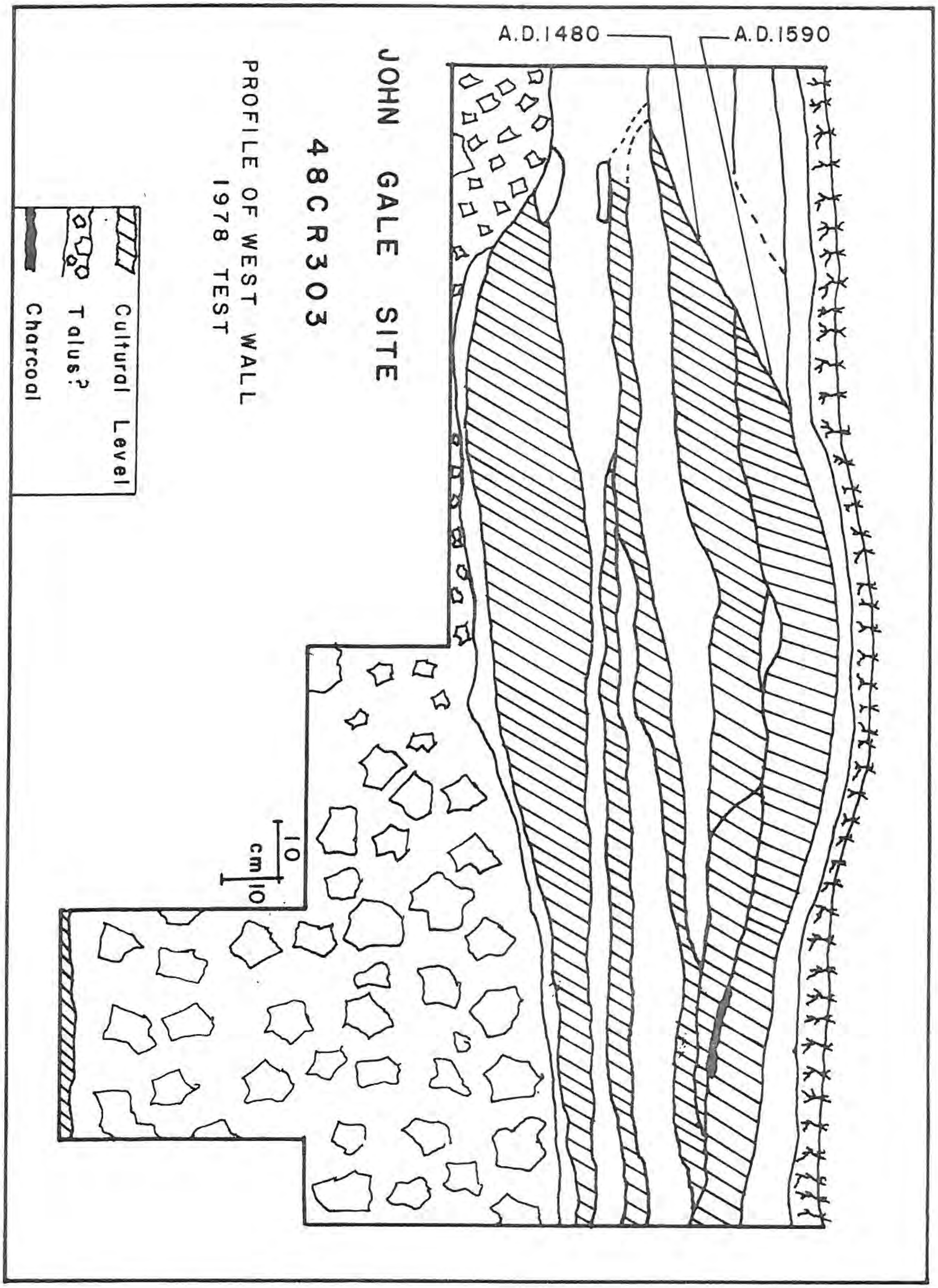
1974 Personal Communication. University of Wyoming. Laramie.

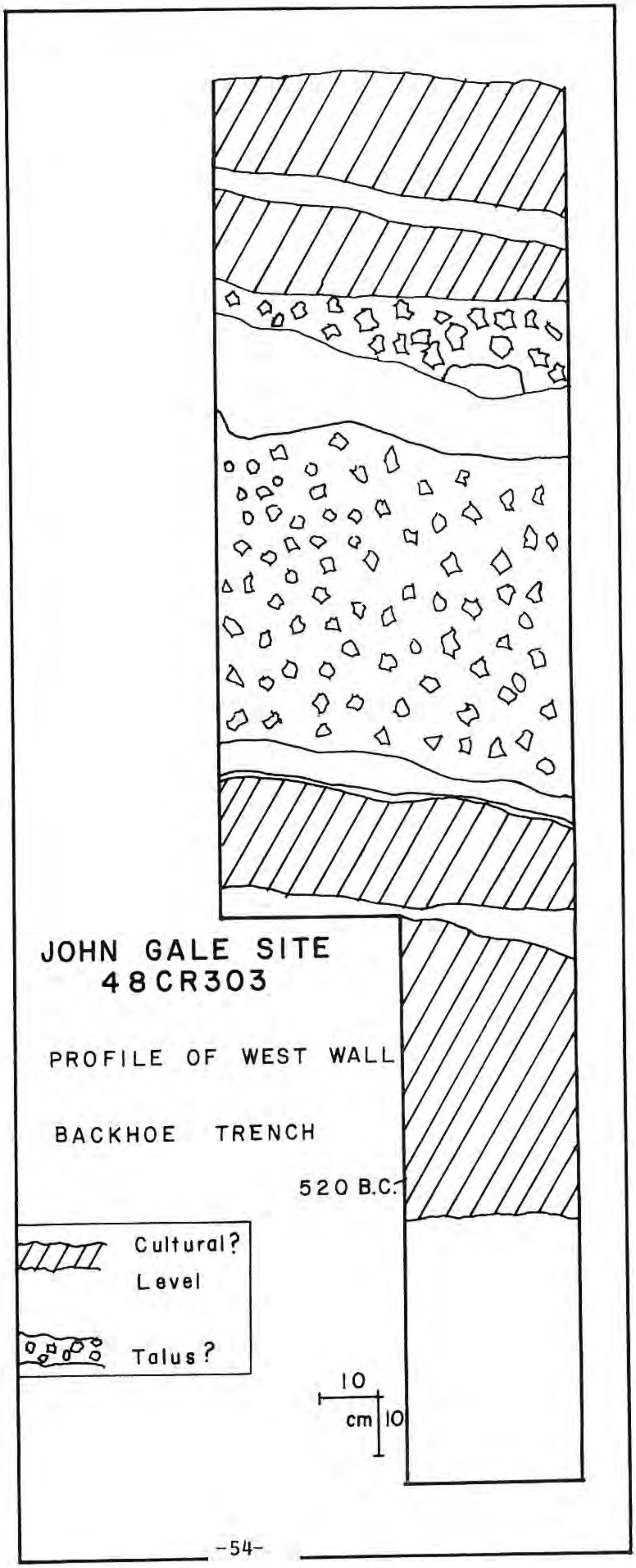
Vass, A.F. and Robert Lang
1938 Vegetative Composition, Density, Grazing Capacity and Grazing Land Values in the Red Desert Area. Univ. of Wyoming Agricultural Experiment Station, Bulletin No. 229.

Yanovsky, Elias
1936 Food Plants of the North American Indians. U.S. Department of Agriculture Miscellaneous Publications, No. 237.

List of Figures


CHEROKEE SPRINGS STREAM CHANNEL
DISTURBED AREAS
BACK-HOE
1978
1974
1975
JOHN GALE SITE
EXCAVATIONS
5 ft.
1 m.
N


JOHN GALE SITE
48CR303
PROFILE OF WEST WALL
1978 TEST
A.D. 1480
A.D. 1590
Cultural Level
Talus?
Charcoal
10
cm
10


JOHN GALE SITE
48CR303
PROFILE OF WEST WALL
BACKHOE TRENCH
520 B.C.
Cultural? Level
Talus?
10
cm 10

IMPLICATIONS OF ETHNOARCHEOLOGICAL RESEARCH ON WYOMING PASTORALISTS FOR HUNTER-GATHERER STUDIES

by

William B. Fawcett, Jr.

Office of the Wyoming State Archeologist
Department of Anthropology
University of Wyoming, Laramie

ABSTRACT

Recent archeological surveys at Carter and within the Medicine Bow National Forest and the Bureau of Land Management Overland Unit have recorded a large number of sites related to open-range sheepherding and cattle ranching operations. The types of sites that have been recorded include: counting pens and corrals, aspen carvings, sheepherder and cowboy camps, and stock driveways. Written records have also been examined for these areas.

The goals of this paper are to: present an analysis of aspen carvings and sheepherder camps; analyze the written records to develop causal models explaining variation in site location, structure, and artifact assemblage composition; and demonstrate the utility of these models and data for improving our understanding of prehistoric hunter-gatherers on the Northwestern Plains.

INTRODUCTION

Theoretical Position

> An unremarkable analogy can be drawn between the aboriginal campsites and modern use of the same area. Rusty tin cans of temporary sheep camps share desert knolls with quartzite flakes and cobbles in many cases found on juniper covered slopes near clear streams (Day and Dibble 1963:41).

While this statement was made nearly twenty years ago, it still reflects the attitude held by historians and prehistoric archeologists. Their attitude is that sheepherder camps are not significant and deserve only a token recording effort. An attempt will be made to demonstrate the significance of sheepherder camps for both archeological and historical research.

Like mining and railroad towns, the archeology of sheep-

TABLE 1. ANNUAL-ROUND OF OPEN-RANGE SHEEPHERDERS IN WYOMING.

	COUNTING	SUMMER TRAILING	SUMMER RANGE	FALL TRAILING	SHIPPING	WINTER RANGE	SHEARING	LAMBING, MARKING & DOCKING
MONTHS:	May-July	June-July	July-Sept.	Sept.-Oct.	Sept.-Oct.	Oct.-June	late April-early May	May-June
ALTITUDE ZONE:	Mid-	Mid- to High	High	High to Mid-	Mid-	Low to Mid-	Mid-	Mid-
FREQUENCY OF CAMP MOVEMENT	Several days	Daily	Summer <Spring	Daily	Several days	Winter <Summer	Two weeks; more frequent in dry years.	Daily?
SHELTER:	Wagons	Wagons	Tent/Cabin (wagon, if road is present)	Wagon	Wagon/ Ranch	Wagon	Wagon/Ranch	Wagon/Ranch
FUEL:	Wood	Wood	Wood	Wood	Wood	Wood & Coal	Wood	Wood
TRASH DISPOSAL	Packed out/ Buried	Packed out/ Buried	Packed out/buried	Packed out/ Buried	Packed out/ Buried in formal dumps	Discarded around camp/Packed out	Formal dump	Formal dump/ Discarded around camps/Packed out
CAMP LOCATION	On edge of National Forest; on trail/road	Adjacent to driveway	Mountain meadows/ Parks	Adjacent to driveway	On railroad/ road	Adjacent to trail/road (Sagebrush-grasslands)	Adjacent to road; Maybe ranch head-quarters.	Adjacent to trail/road?
SPECIAL TOPO-GRAPHIC POSITION	None	None	None	None	None	Ridgetop	None	None
SUPPLE-MENTAL FEEDING	None	None	None	None	None	Yes	Yes?	Yes?
WATER SOURCE:	Stream	Stream	Stream	Stream	Stream/well	Snow	Snow, stream, or well	Stream/snow?
CAMP RE-USE:	Frequent (Annual)	Frequent - linear scatters	Rare	Frequent- linear scatters	Frequent (Annual)	Frequent	Frequent (Annual)	Frequent (Annual)
SPECIAL FACILI-TIES	Counting pen	None	None	None	Corral/ shipping pen	Cairns/ Monuments	Shearing pens (Optional)	Lambing shed (Optional)

4

herder camps deserves consideration due to the contribution by this industry to the development and settlement of the Western United States.

Sheepherder camps can also be studies from an ethnoarcheological perspective. Studies of this sort would examine correlations between site structure, tool assemblage composition, and sheepherder behavior. Sheepherder camps can be viewed an analogous to prehistoric limited activity sites. More permanent towns, ranch complexes, and homesteads may be analogous to so-called perhistoric habitation camps or base camps.

In addition, it is argued that sheepherder and prehistoric settlement patterns are comparable, since the location of both are determined by availability of water and plant resources. Sheepherder settlement behavior may be more analogous to that of specialized bison hunters. This is because specialized bison hunters are dependent on a single animal species, just like sheepherders. The distribution and abundance of bison populations, like those of sheep, are regulated by the availability of grazing matter. Finally, both sheepherders and specialized bison hunters depend on stored supplies for considerable portions of the year. Sheepherders are dependent on canned food, while specialized hunters use dried, smoked, and naturally frozen meat obtained through communal bison kills.

Besides contributing to the development of middle range theory concerning site and assemblage structure and variability, ethnoarcheological research can contribute to current ecological and evolutionary theory. These theories are being used to explain changes in adaptation. For example, Reher (1977) has recently proposed that during poriods with higher precipitation on the Northwestern Plains that bison populations increase due to the greater availability of forage material. In turn, human populations shift from more generalized hunting and foraging to specialized bison hunting. Social organization and territoriality are altered as well. Historical data on precipitation, sheep population, and herding strategies may be useful for evaluating this model.

Sheepherders in Wyoming utilize adaptive strategies similar to pastoralists throughout the world. By investigating the more readily accessible sheepherder camps in Wyoming, we can learn about the archeology of pastoralists in general. Since switching between sheepherding, cattle raising, and dry-land irrigation farming occurred (Barnhart 1969: 160-167), models concerning the economics and development of incipient agricultural systems, such as those in Mespotamia, can be investigated. Hence, sheepherder camps have significance for not only Western and frontier history, but also for major anthropological (and archeological) research problems.

TABLE 2

HISTORIC ARTIFACT FREQUENCY PATTERNS

a) Percentage of artifact groups at Red Desert Sheepherder camps

Artifact group	2-28-1	48SW 1504	48CR 1293	48CR 1296	48CR 1317	48CR 1320	Total
Kitchen	1.27	6.12	4.03	6.02	7.69	4.55	4.71
Architecture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Furniture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arms	0.00	0.00	0.81	0.00	0.00	0.00	0.20
Clothing	2.53	0.00	0.00	0.00	0.00	0.00	0.41
Personal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tobacco	2.53	10.20	1.61	4.82	0.00	3.40	3.28
Activities	93.67	83.67	93.54	89.16	92.13	92.05	91.39
Total (n)	79	49	124	83	45	88	488

b) Comparisons with regional site clusters (Fawcett 1980)

Artifact group	Regional site clusters I	II	III	Sheepherder camps
Kitchen	18.7±11.7	40.2±10.4	63.6±14.9	4.71
Architecture	65.7±16.2	49.3± 7.7	19.1±10.3	0.00
Furniture	0.1± 0.1	0.2± 0.3	0.1± 0.1	0.00
Arms	2.5± 4.2	1.7± 2.7	1.1± 2.3	0.20
Clothing	1.7± 3.3	2.5± 5.9	3.7± 5.5	0.41
Personal	1.0± 2.4	0.2± 0.2	0.4± 0.5	0.00
Tobacco	1.1± 2.4	1.3± 3.4	2.1± 3.0	3.28
Activities	9.0± 8.6	4.3± 4.7	8.6± 4.3	91.39

c) Pearson product-moment correlation

	I	II	III
Sheepherder camps	-0.062	-0.146	-0.098

d.f. = 6 All have $p > 0.10$

Note: The railroad communites of Carter (48UT340) and Separation (48CR1059) are within Cluster III.

Annual Round

Open-range sheepherders in Wyoming follow an annual round similar to pastoralists throughout the world. During the summer, they move into high-altitude mountains (>8000 feet), frequently within the National Forests (Table 1). In the winter, low-altitude basin interiors are exploited (<6900 feet). The mid-altitude (6900-8000 feet) zone is used during the fall and winter (Utter 1964:5, Wing 1912:223, Todd 1980, Tigner and Larson 1977). The sheepherding activity in each of these altitude zones are distinctive (Table 1).

During the winter (October-June), camps tend to be located on ridges independently of drainage locations. Winter camps have extensive trash, wood, and coal scatters. Supplemental feeding of sheep is indicated by the presence of bailing wire and hay scatters at these camps. Cairns are also located on hilltops in the vicinity of winter grazing areas. All of these characteristics are present at sheepherder camps in the Red Desert and around Carter, Wyoming (see also Dunham and Dunham 1977:303 for historical data supporting winter use).

Some elements of the sheepherding settlement system do not vary from season to season. Sheepherders tend to work alone. They are necessary as long as predators are abundant and the range is not fenced (Kornfeld 1980:2). While most of these sheepherders are Basques in northern Wyoming, in the rest of the state most of the sheepherders are Irish or Mexican. (Sokolov 1980:97, Kilker 1978:52-65, 69; Bruce 1959:136, 142; Brown 1980:172).

These herders are supplied by camp tenders once or twice a week (Tigner and Larson 1977:252). Camp tenders are also responsible for bringing food and water to the herders, and for moving the herders camp (Erickson 1979:5, Hultz and Hill 1931:44).

Range conditions and water are the primary determinants of settlement location and movement (Todd 1980:4). Increased sheepherder camp movement reduces forage loss (Hultz and Hill 1931: 14). This strategy of increasing mobility is frequently used during dry years or years when early snow melt occurred (Todd 1980:4). It was done in anticipation of future needs. Usually about 2 kilometer radius around the camp is the maximum area that could be grazed. Salt may be used to restruct stock movement to this area (Hultz and Hill 1931:14). At least 25 percent of the grass must be left for seeding material (Hultz and Hill 1931: 97).

SHEEPHERDER CAMPS

Research Problems

Given that the sheepherder camps along the Carter Northwest Highway and in the Red Desert are from winter use, and perhaps

TABLE 3

ARTIFACT GROUP PERCENTAGES FOR CARTER NORTHWEST PROJECT

HISTORICAL SITES.

a) Percentages: Sheepherder Camps.

Artifact Group	Carter Northwest 48UT 324	48UT 325	48UT 326	48UT 328	48UT 329	48UT 331	48UT 336	48UT 339	mean	s.d.	Red Desert sheepherder camps
Kitchen	11.8	0.0	15.2	16.7	10.8	11.1	1.9	4.2	9.0	6.2	4.7
Architecture	0.0	0.0	0.0	0.0	2.7	0.0	1.9	0.0	0.6	1.1	0.0
Furniture	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arms	3.9	0.0	0.0	0.0	0.0	0.0	5.7	0.0	1.2	2.3	0.2
Clothing	0.0	0.0	4.3	0.0	2.7	0.0	1.9	0.0	1.1	1.7	0.4
Personal	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.3	1.0	0.0
Tobacco	3.9	9.0	10.9	0.0	0.0	0.0	0.0	0.0	3.0	4.5	3.3
Activities	80.4	91.0	69.7	83.3	81.1	88.9	88.8	95.8	84.9	8.1	91.4
Diversity:	.681	.303	.915	.451	.703	.349	.495	.174	.509	.244	

b) Percentages: Historic dumps and Carter, Wyoming

Artifact Group	48UT 330	48UT 334	48UT 338	mean	s.d.	Town of Carter
Kitchen	49.3	74.2	63.2	62.23	12.48	81.7
Architecture	0.0	2.9	10.5	4.47	5.42	10.5
Furniture	0.0	0.0	0.0	0.00	0.00	0.1
Arms	2.5	0.0	0.0	0.83	1.44	0.3
Clothing	3.7	0.0	0.0	1.23	2.14	0.4
Personal	0.0	0.0	0.0	0.00	0.00	0.1
Tobacco	6.2	0.0	15.8	7.33	7.96	0.1
Activities	38.1	22.9	10.6	15.60	13.54	6.8
Diversity:	1.10	.662	1.06	.941	.242	.645

c) Correlation matrix - mean artifact percentages

	Carter Highway Sheepherder Camps (1)	Red Desert Sheepherder Camps (2)	Carter Highway Dumps (3)	Town of Carter (4)
1)	1.000	0.999	0.175	0.005
2)		1.000	-----	-----
3)			1.000	0.977
4)				1.000

Note: Underlined correlation coefficients have $p > 0.05$

trailing, a number of research problems can be proposed.

1) Sheepherder camps along the Carter Northwest Highway should have artifact frequencies similar to those at winter sheepherder camps in the Red Desert. These sheepherder camps should have artifact frequencies that are distinct from those of various types of townsites (See Table 2). The differences between townsites and sheepherder camps are due to the absence of permanent architectural features and the discard of artifacts in the proximity of their usage at sheepherder camps.

2) Artifact density (number per m^2) and tool diversity (H') should be less at sheepherder camps than at habitation or townsites. The lower artifact density and diversity at sheepherder camps is due to briefer usage by smaller populations for more specialized sorts of activities. Variation in diversities and densities should be more restricted at sheepherder camps.

3) Reoccupation of sheepherder camps should cause: the existence of more wood scatters, greater artifact density, and higher artifact diversity.

4) If sheepherders and prehistoric foragers in an area are both dependent on grasses for food, then we might expect a large percentage of sheepherder and prehistoric sites to occur in spatial association. Since utilization of grass seeds should vary seasonally, it might be possible to map zones of grass seed usage through examination of this spatial association. If prehistoric sites in areas with a high degree of association with sheepherder camps are grass seed utilization loci, then 1) their assemblages should be distinctive from prehistoric sites in areas of low association; 2) their assemblages should have large numbers of groundstone (manos and metates) and seed knives (Thomas 1971). These seed knives should have wear and use-edge morphologies distinctive from other sorts of tools.

5) The frequency of sheepherder camps over time should correlate with historically documented trends in sheep populations.

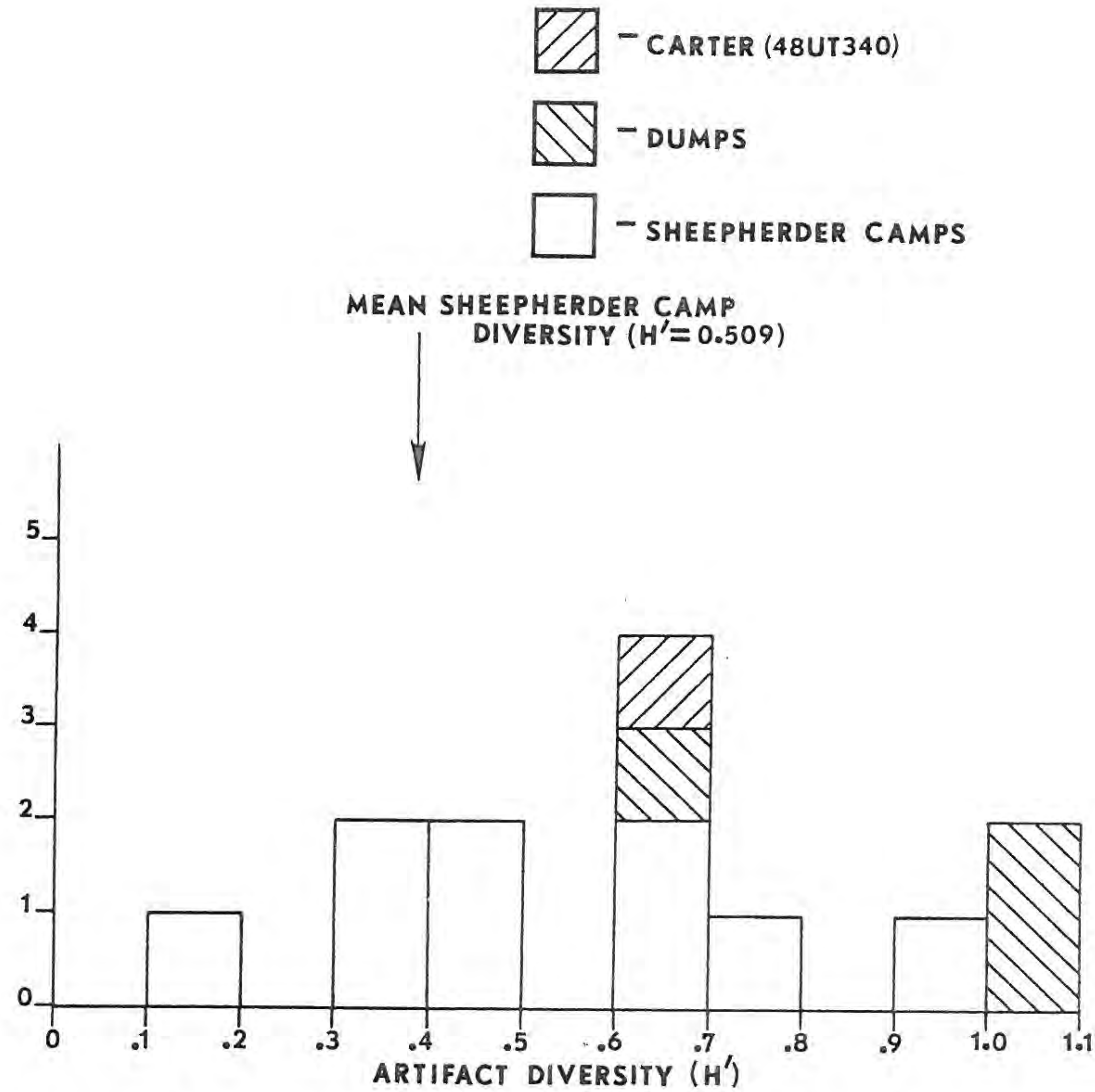


Figure 1. Histogram of assemblage diversities for sites along the Carter Northwest Highway.

Analysis

The sheepherder camp data were collected as part of the archeological surveys of the Carter Northwest Highway (Fawcett, Latady, and Hokenstad 1981) and the Bureau of Land Management Overland Unit.

The first problems states:

> Sheepherder camps along the Carter Northwest Highway should have artifact frequencies similar to those at winter sheepherder camps in the Red Desert. These sheepherder camps should have artifact frequencies that are distinct from those of various types of townsites (See Table 2). The differences between townsites and sheepherder camps are due to the absence of permanent architectural features and the discard of artifacts in the proximity of their usage at sheepherder camps.

In Table 3 the percentage of artifacts are compared between sheepherder camps in the Carter Northwest project and those from the Red Desert. Similar artifact group percentages are also compiled for dumps and townsites.

Pearson's product-moment correlation coefficient is used to measure the degree of similarity between these sites. The results confirm our initial predictions. There is no significant difference in artifact frequencies between sheepherder camps in the Red Desert and those within the Carter Northwest project. In contrast, the artifact frequencies for Carter and its dumps are significantly different from the sheepherder camps. No significant differences in artifact frequencies exist within the group of sheepherder camps.

The second research problem concerning sheepherder camps can be stated as follows:

> Artifact density (number per m^2) and tool diversity (H') should be less at sheepherder camps than at habitation or townsites. The lower artifact density and diversity at sheepherder camps is due to briefer usage by smaller populations for more specialized sorts of activities. Variation in diversities and densities should be more restricted at sheepherder camps.

Artifact diversities are computed using the Shannon-Weaver diversity index (H') (See Table 3). A histogram illustrates the distribution of these values for sheepherder camps, dumps, and townsites (Figure 1). The number of historic artifact types is comparable to the number of prehistoric artifact types. Use of the natural log in the diversity index calculations also makes

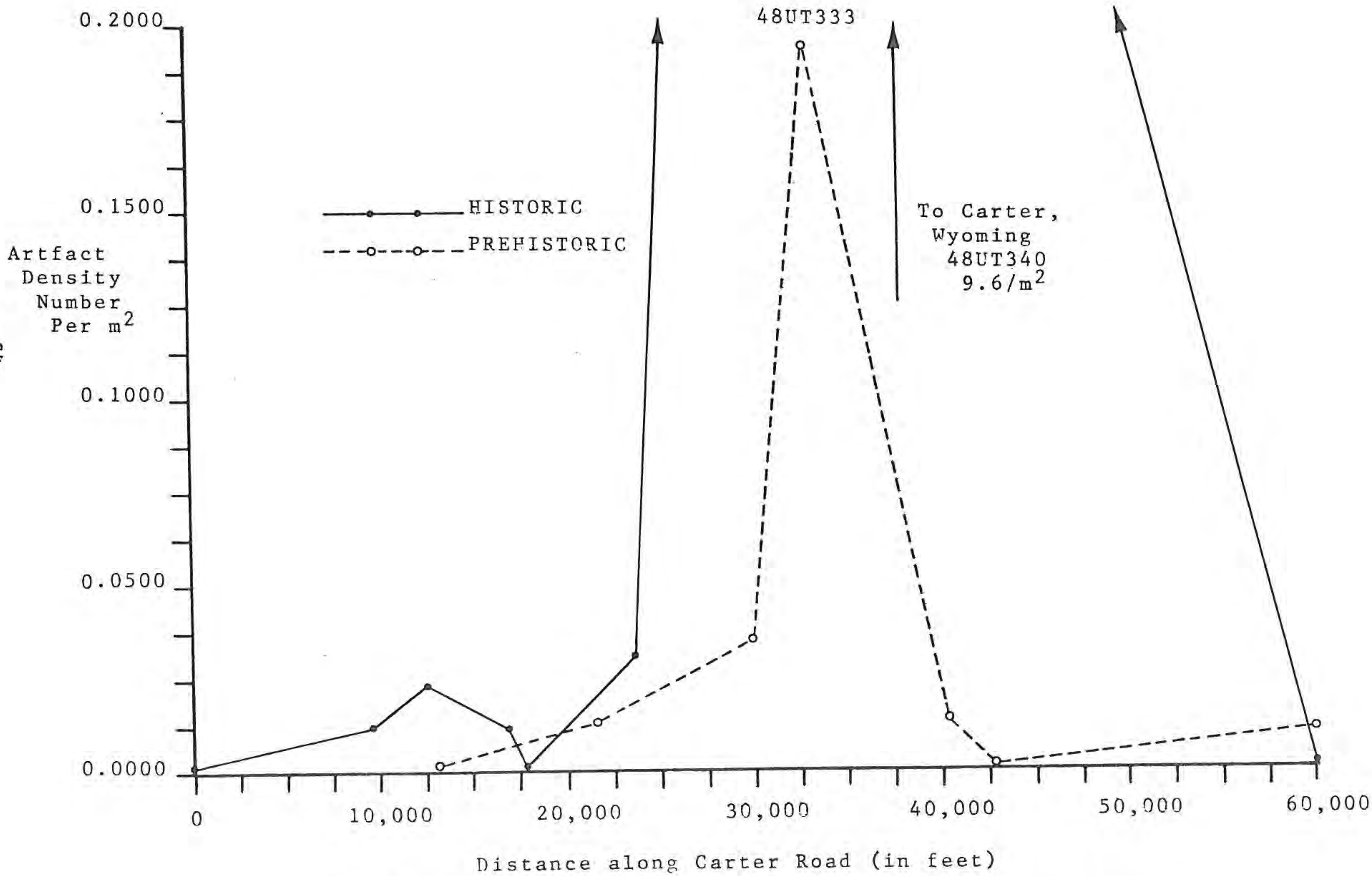


Figure 2. Artifact densities along the Carter Northwest Highway, Wyoming.

these results comparable to those for prehistoric sites (cf. Reher 1978:248).

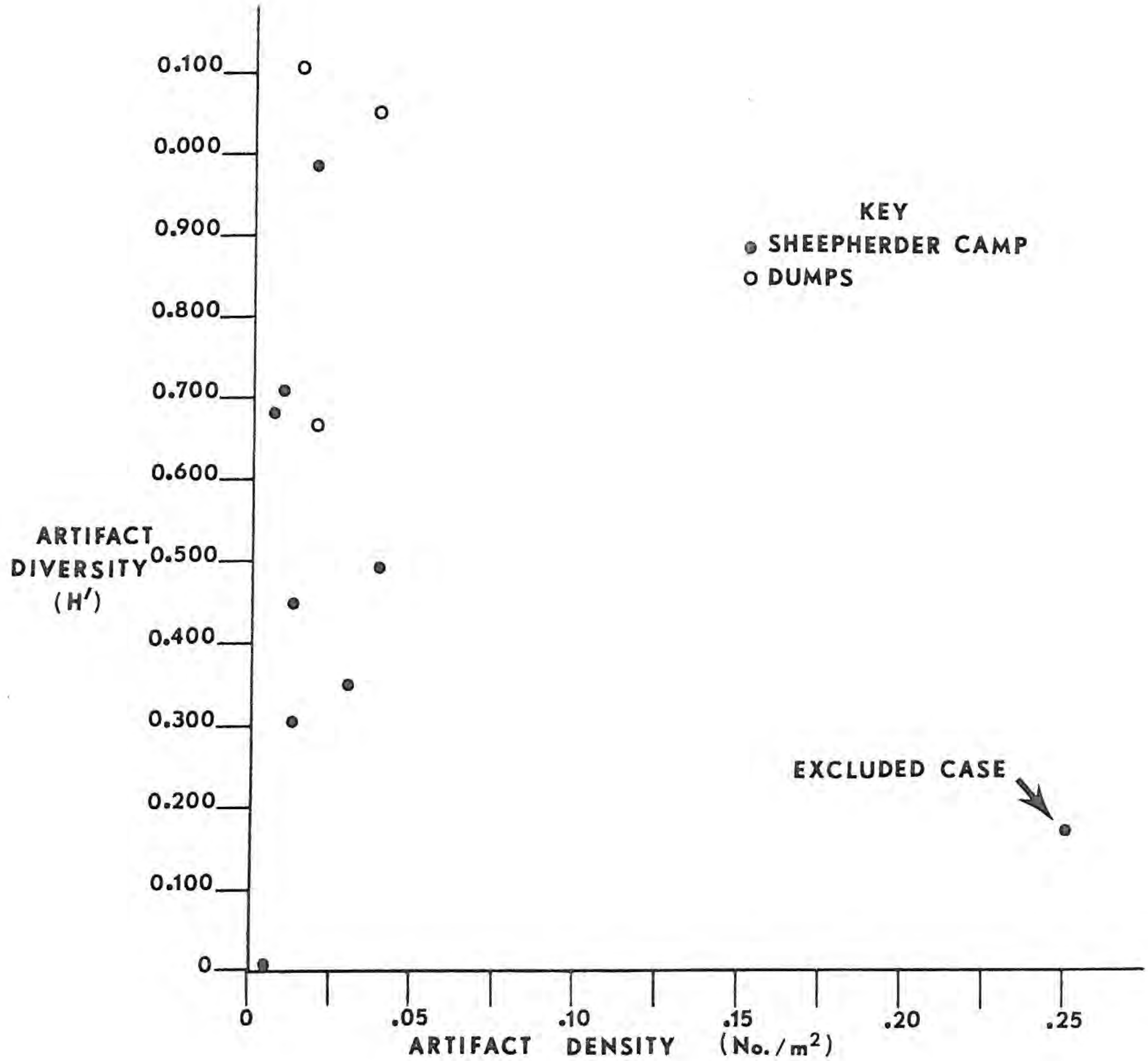
Contrary to the predictions for this second problem, a bimodal distribution is not indicated by the data (Figure 1). Reher (1978:247) found a clear separation between low diversity limited activity sites and high diversity habitation sites. He suggests that a diversity of about 0.8 is the cut-off between the two groups.

At Carter Northwest the artifact diversities for dumps and townsites are as low as 0.6. The average artifact diversity of the sheepcamps is almost identical (mean = 0.509). No distinction between limited activity (sheepherder camps) and habitation sites (dumps and towns) is possible on the basis of artifact diversity alone.

Since sheepherder camps represent the camps of a few individuals doing similar activities during the same season of the year (winter-early spring) then a narrow range of tool types would remain on these sites. Little variation should occur from one camp to the next. This proposal is not supported by the data from the Carter Northwest Project (Figure 1). Instead of exhibiting a narrow range of artifact diversities, sheepherder camps have diversities that vary from 0.1 to 1.0. This may be because our assumptions about seasonality and activities are wrong, or because other factors, such as reoccupation, are creating greater diversity on sheepherder camps. Before this third problem of reoccupation is examined, data on artifact densities will be presented to test the remaining portion of the second problem.

Both prehistoric and historic artifact densities are graphed in Figure 2. Each point on the graph represents an archeological site, and these sites are ranked from north to south according to their location along the Carter Northwest Highway. As can be observed in the graph, historic site artifact density increases as distance from Carter decreases. This pattern can be explained.

The town of Carter serves as a shipping point and resupply center for sheep ranchers in Uinta County. It is a central place. Certain topographic situations are sought for ideal camp locations. These are high ridges, with a road or trail, that overlook a sheltered bed ground. As the distance to a central place, such as Carter decreases, fewer of these ideal camp locations would be available. Hence, as distance from the central place decreases, more frequent reoccupation of camp sites should occur. This would cause an increase in artifact density on these reoccupied sites, since topographic constraints would prevent the creation of extensive camps.



	r	df	p
SHEEPHERDER CAMPS —	−.342	7	<0.05
SHEEPHERDER CAMPS AND DUMPS —	−.304	13	<0.05
EXCLUDED CASE —	+.331	12	<0.05

Figure 3. Graph of artifact diversity against artifact density for sites along the Carter Northwest Highway.

This explanation can be independently evaluated with the prehistoric artifact density data (Figure 2). In this case, site 48UT333 should have the highest artifact density, since it is a chipping station. As distance from this chipping station increases, artifact density should decrease. This is due to the combined reduction in site reoccupation and the increase in the use of formal curated tools as raw materials became less accessible. Fewer of these formal curated tools would be discarded per unit of occupation time than at sites where expedient tools predominated. Formal curated tools include thin bifaces, projectile points, and scrapers. Utilized and retouched flakes, gravers, denticulates, and notches are expedient tools.

The data from Carter Northwest prehistoric sites support this explanation (Figure 2). The highest artifact density occurs at 48UT333. The fall-off in density is slightly more gradual to the north than to the south. No prehistoric sites are present in the northernmost segment of the Carter Northwest Highway. It is suggested that this represents a no man's land or boundary between prehistoric groups center around 48UT333 and Muddy Creek, and those to the north, centered around Cumberland Gap. This boundary occurs at about a six mile radius from 48UT333. A six mile radius is foraging distance of hunter-gatherers in arid regions. The existence of these proposed territory boundaries can be tested as part of future archeological surveys in the area.

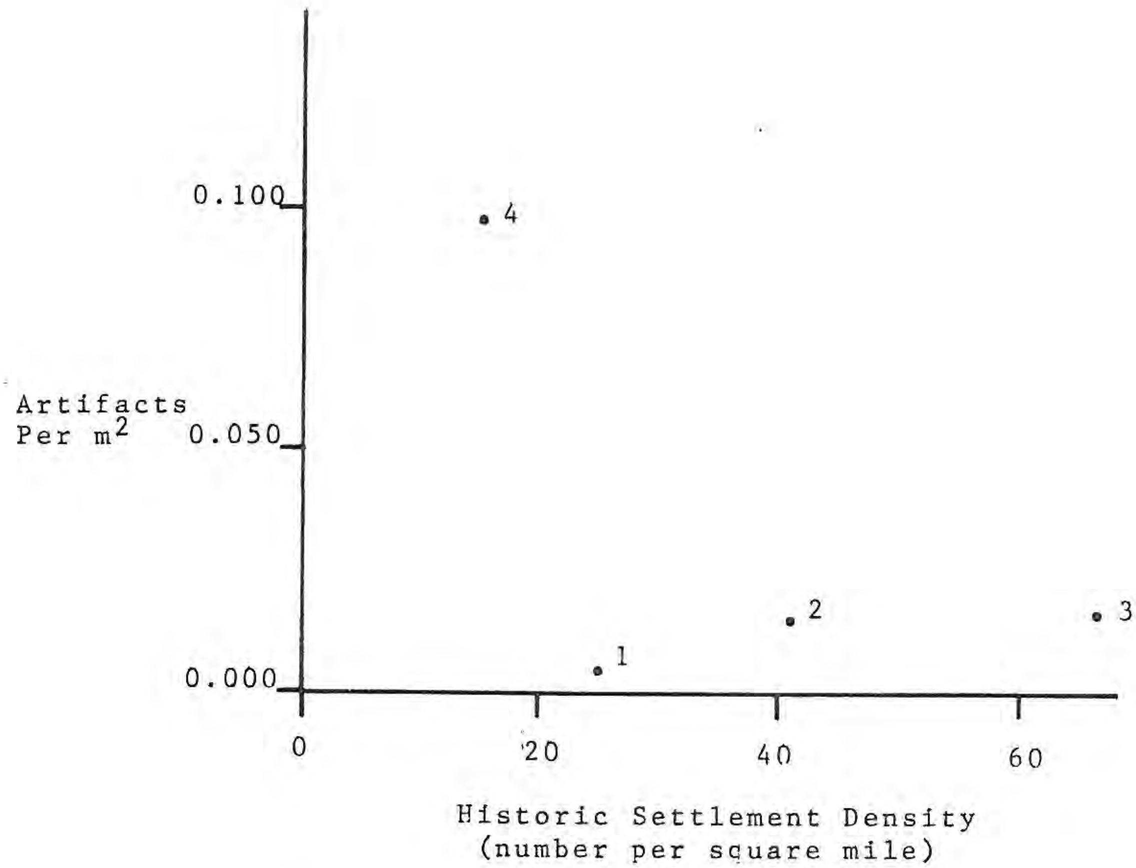
If artifact density and assemblage diversity can be explained by reoccupation, then a significant ($\alpha<0.05$) positive correlation should exist between these variables. As illustrated in Figure 3, this is not the case. The correlation between artifact density and assemblage diversity is low. The sign of the correlation coefficient changes, depending on whether or not the excluded case is omitted. Other factors besides reoccupation must be causing the variation in artifact or assemblage diversity. However, artifact density may still be indicative of site reuse or reoccupation.

The third sheepherder camp research problem is concerned with reoccupation. It can be stated as:

> Reoccupation of sheepherder camps should cause the creation of more wood scatters, greater artifact density, and higher artifact diversity.

Artifact diversity and density have already been discussed. While density may increase with reoccupation, variation in diversity is less predictable.

Pearson's product-moment correlation coefficients have been computed comparing the number of wood scatters to artifact diversities and densities. Neither correlation is significant ($p>0.010, \alpha<0.05$). This may be due to the fact that wood scatters are repeatedly reused during different reoccupations. Sites with



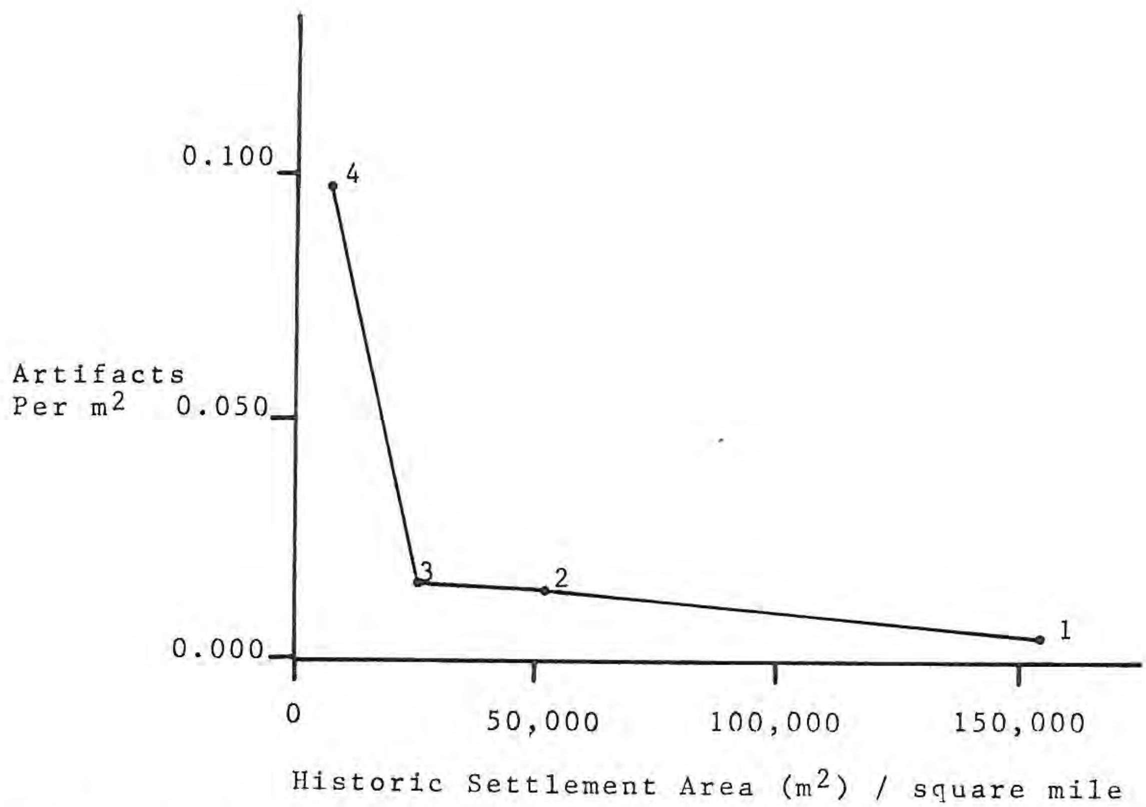


Figure 4. Graph of historic settlement density and extensiveness against artifact density using data from the Carter Northwest Highway.

more wood scatters may simply be locations where more extensive occupations are possible. Such locations would include flat-topped ridges and buttes.

In order to predict which sites were reoccupied, artifact density is still the best variable. A measure of settlement density might be useful as well. For example, single occupation sites might be expected to have low artifact density and to be very numerous, i.e., have a high site density. In contrast, repeatedly reoccupied sites should have higher artifact and lower site densities. The lower site density is due to the use of fewer alternative site locations.

The site density variable must include more than simply the number of sites per unit of space (Figure 4). It must also include a measure of settlement extensiveness. This settlement extensiveness variable can be defined as the number of square meters of settlement per square mile. It is realized that we are mixing metric and English units of measure, but for temporary purposes this variable will do.

Another problem occurs because the settlement extensiveness variable is a spatial or aerial measure. To resolve this problem one can compute the variable goruping sites together by the section within which they occur. Then all the sites in this section can be assigned the same value. When graphing these values for settlement extensiveness, each site's artifact density can be plotted against its corresponding extensiveness value, or, as will be done here, the mean artifact density of all the sites within a section can be calculated. This can then be plotted against the corresponding extensiveness values.

On the basis of the argument just presented, a negative correlation is expected between artifact density and settlement extensiveness. While the available sample of sheepherder camps from the Carter Northwest project is small, it does confirm the predictions. Sites are also ranked from one to four according to their distance from Carter. Four is the closest site to Carter. Earlier, on the basis of artifact density alone, it was suggested that sites closer to Carter were the most recently reoccupied. The bivariate graph supports this proposal since the sites are ranked according to their true spatial relationships. The town of Carter is not included on this graph. Carter has both high density and high settlement extensiveness.

This measure of reoccupation can not be applied to the prehistoric sites. If the degree of reoccupation is being measured, then 1) a negative correlation should exist between artifact density and settlement extensiveness; 2) sites with higher density and less extensiveness should be closer to 48UT333; and 3) 48UT333 should have high values on both axes.

The data available from four prehistoric sites are plotted in Figure 5. The predicted negative correlation is present in

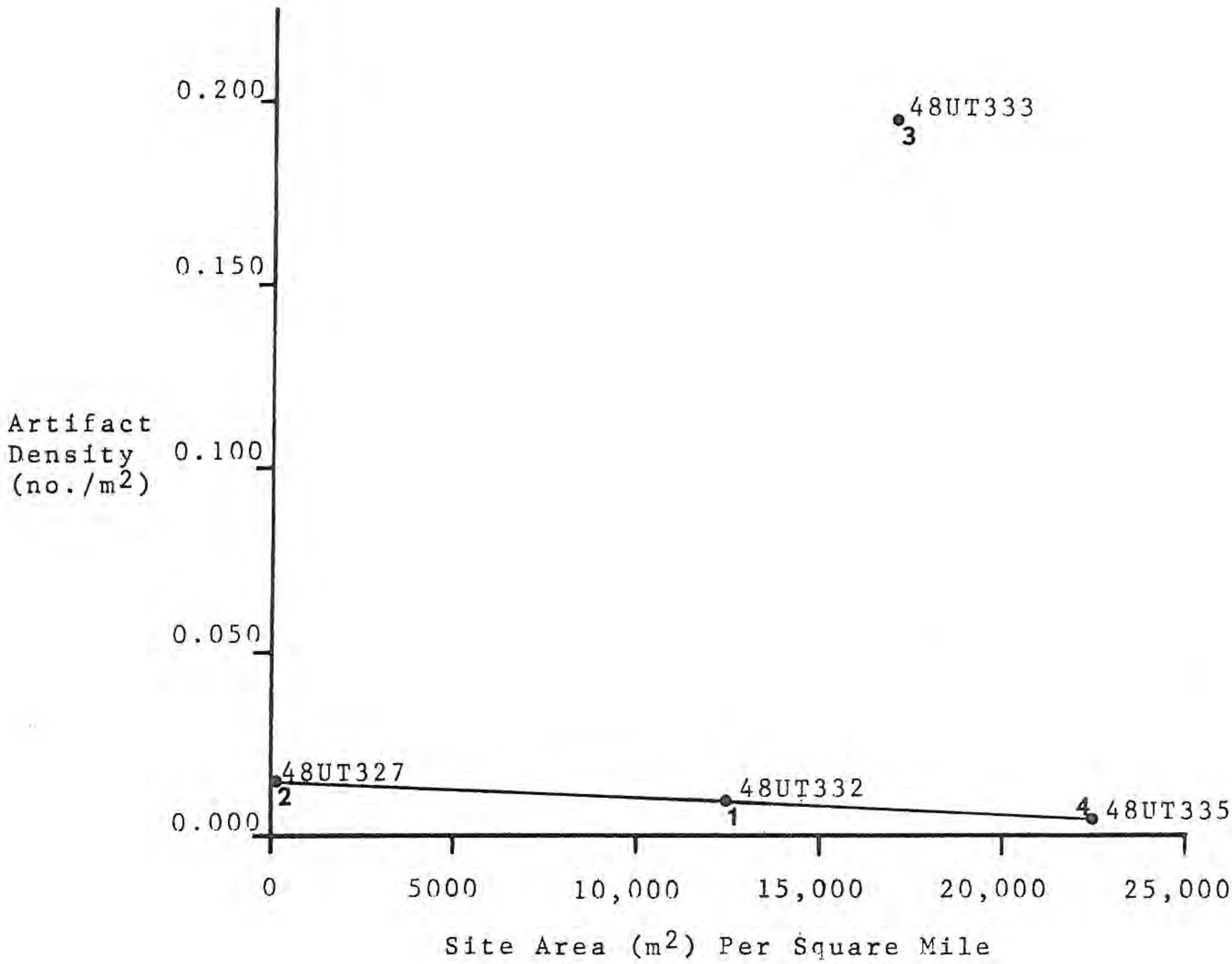


Figure 5. Bivariate plot of prehistoric site extensiveness and artifact density.

these data. Site 48UT333 has high values on both axes, just as predicted. Site 48UT335 is located in the borrow pit, closer to the Black's Fork than to 48UT333. It may fall within a three mile resource exploitation territory centered around Black's Fork. Its position on Figure 5 can be interpreted as indicating that only a single occupation occurred. The two other sites (48UT327, and 48UT332) are accurately ranked according to their distance from 48UT333. The analytical results from both the sheepherder and prehistoric settlements appear to agree.

The fourth sheepherder camp research problem concerns the association of sheepherder and prehistoric settlements in space. Because examination of this problem requires more data than are presently available, it will not be examined here.

The last problem concerns trends in sheepherder camp frequency and sheep populations over time. Archeologists frequently assume that when they find a greater number of sites from one time period than another that population has increased. If we assume: 1) a constant rate of sheepherder camp creation and usage, and 2) that the proportion of sheepherders to sheep remained constant; then any change in the number or total area of sheep camps should be due to population increase in the numbers of herders and sheep.

Analysis of historical records for the Green River Basin from 1956 to 1974 indicates a continuous decline in the number of sheep being grazed (Figure 6). This decline probably began in the 1920's to 1940's period. If the data from Carter Northwest accurately reflect this trend, then site area (m^2) per year should decline from at least 1956 to the present.

Contrary to expectations, the Carter Northwest sheepherder camp data indicate an increase in site area per year from before 1950 and continuing through 1970 (Figure 7). The lack of conformity between the predictions and the data can be explained in a number of ways:

1) errors in dating the artifacts;
2) reoccupation of sites masked and altered earlier artifactual remains;
3) a change occurred in either the ratio of herders to sheep or the duration and frequency of site use.

While the possibility that errors occurred in the dating of the artifacts exists, this is believed to be the least likely of the three explanations. Reoccupation could be eliminated as a factor by using the bivariate plot (Figure 4) to exclude all but the single occupation sites. These could then be graphed. To do this would require a much larger sample of sites than what is presently available. Perhaps with the addition of the sites along the Cumberland segment, examination of this problem might be possible.

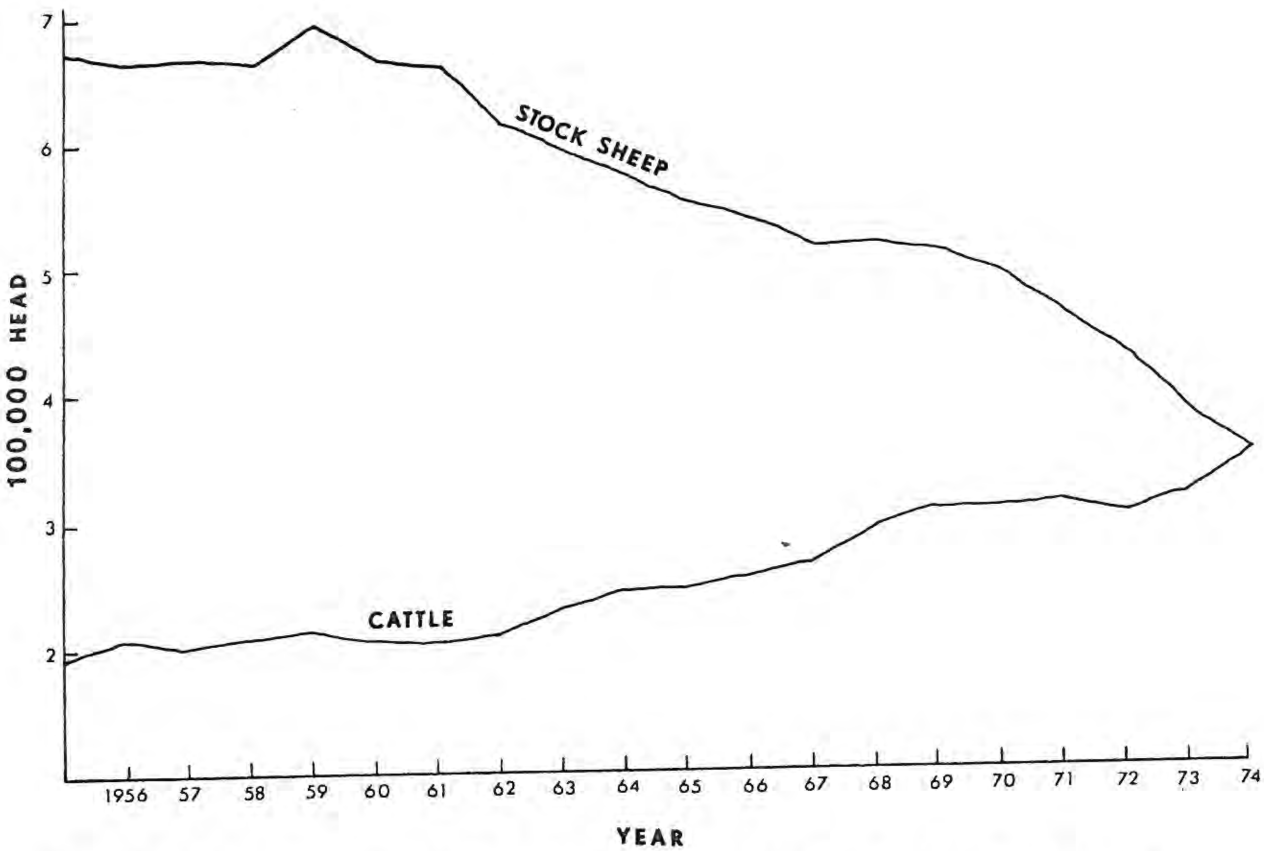


Figure 6. The number of sheep and cattle grazed per year in the Green River Basin, Wyoming.

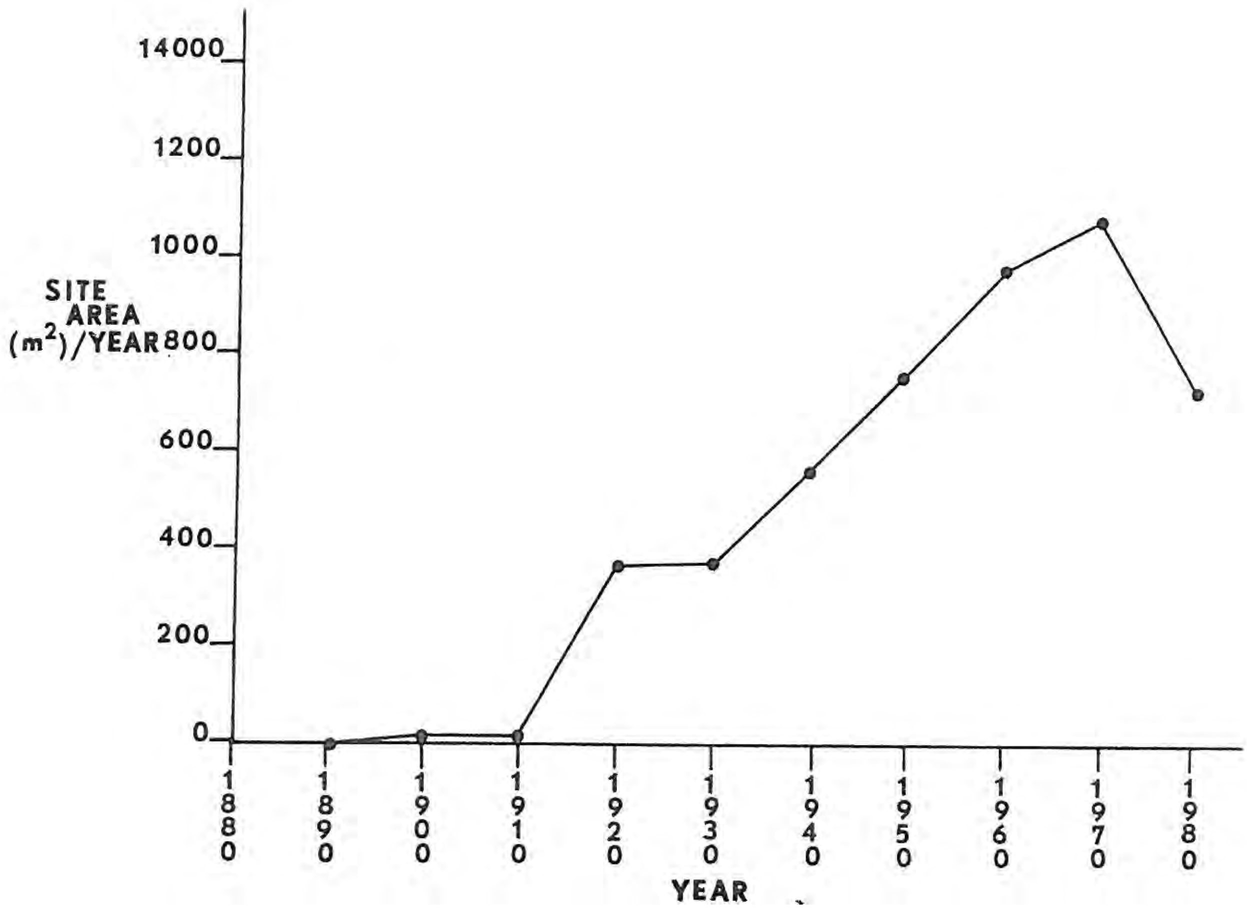


Figure 7. Amount of site area (m^2) per year for sheepherder camps along the Carter Northwest Highway.

The most probable explanation is that a change occurred in either the frequency of settlement creation and abandonment, or in the ratio of herders to sheep. This explanation can be examined by collecting ethno-historical and oral historical data. It is recommended that this be done as part of future archeological research in Southwestern Wyoming.

The utility of detailed archeological analysis of open-range sheepherder camps has been demonstrated. Such analysis helps us to better understand the site formation processes and the factors creating variation in assemblage composition. It is hoped that archeologists and historians will begin to more consistently record and analyze these camps.

ASPEN CARVINGS

During the 1980 archeological survey in the Medicine Bow National Forest, 407 aspen carvings were recorded as to location, elevation (in feet), and information about the sheepherder who carved each particular one (Fawcett and Francis 1981). Frequently the carver included his name and the date on which the carving was made. Some of these carvings include works of folk art. Most of the analysis done on these data has been oriented towards assessing to what extent the aspen carvings can be utilized as an independent measure of sheepherder behavior and sheep population dynamics.

A histogram shows the frequency of carvings that occur for each month of the year (Figure 8). Since the mountains or high-altitude zone is only used during the summer (July through September) (Table 1), most of the carvings should also occur during this time. Figure 8 demonstrates that this is the case.

Next, the change in aspen carving frequencies over time is evaluated. If carvings are created at a constant rate per herder, then the number of carvings from a particular year should inform us about the number of sheepherders that operated within the forest. As long as the ratio of herders to band size remains constant, aspen carvings can be used as an indirect measure of sheep population. Figure 9 is a histogram of the frequency of aspen carvings for each ten year period. The curve is almost perfectly normal. Early carvings (prior to 1920) may be under represented due to natural tree mortality and regrowth. However, the measures of central tendancy (mean, mode, and median) cluster between 1943 and 1945 which is almost identical to the historically documented peak in sheep population (1942). Once again, aspen carving frequencies appear to be accurately measuring the dynamics of the sheepherding system.

Figure 10 is a graph of the change in average elevation per month for aspen carvings. Historical records indicate that sheep are trailed into the forest during the period between late

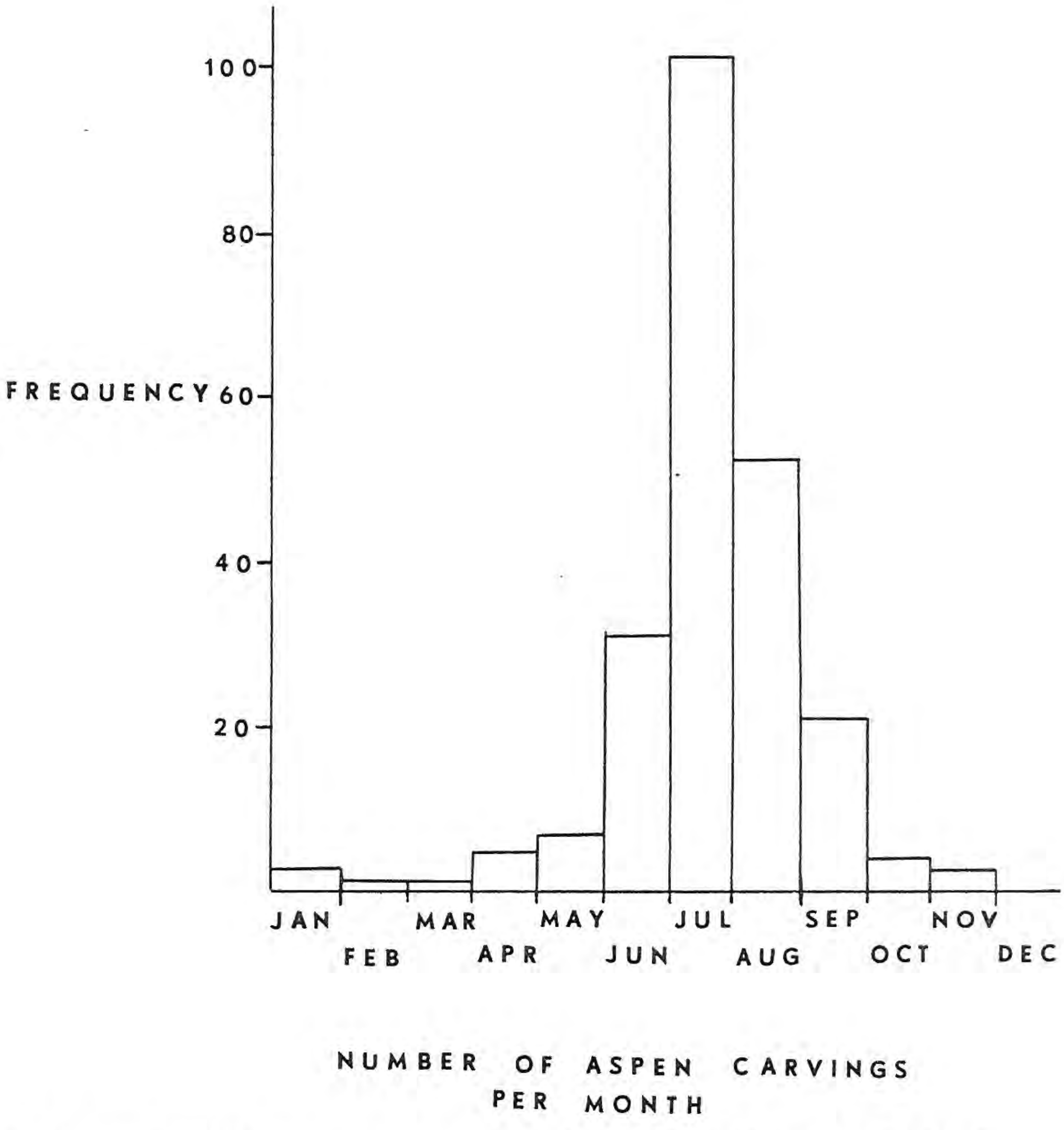


Figure 8. Number of aspen carvings per monrth for the Medicine Bow National Forest, Wyoming.

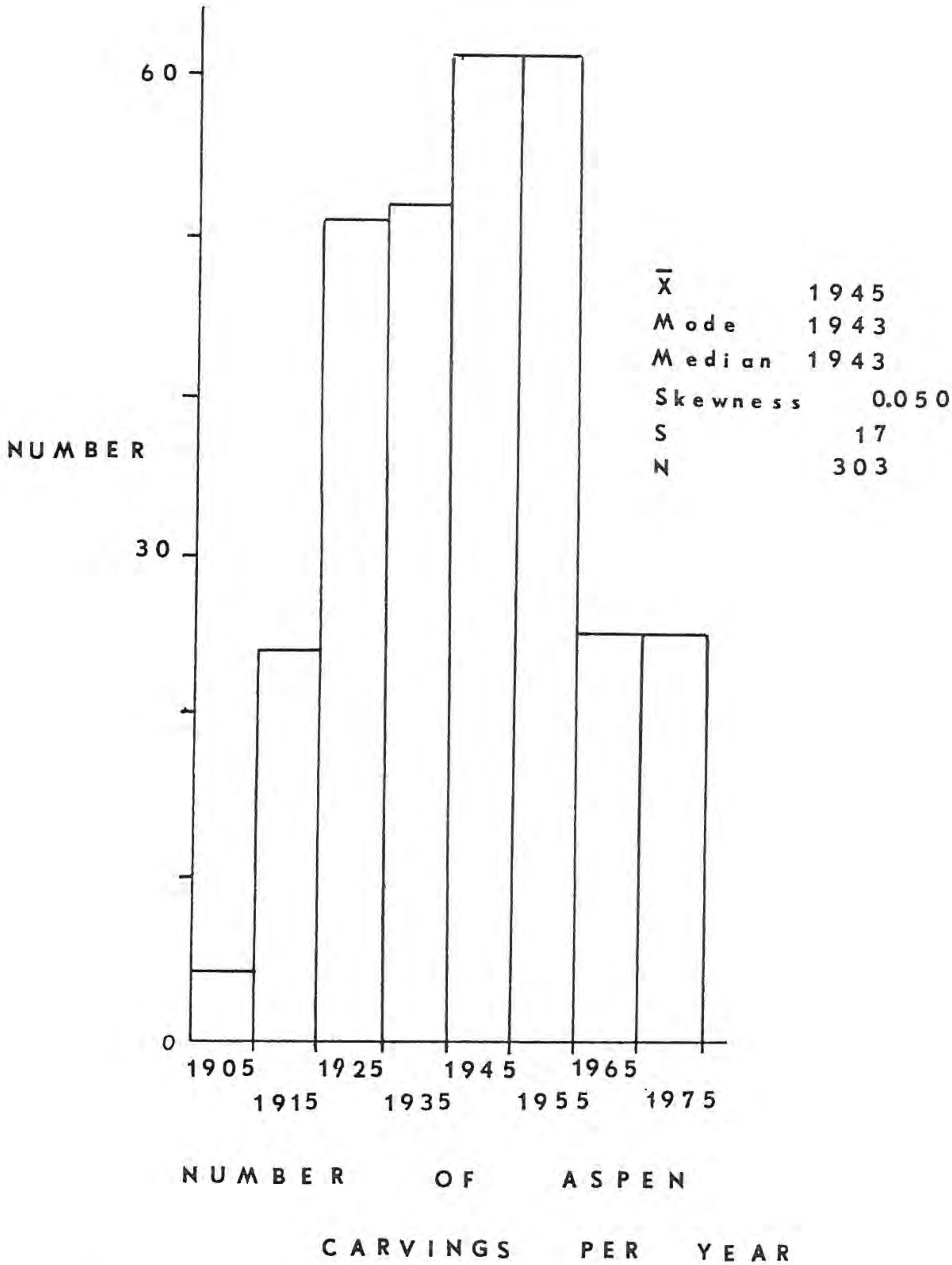


Figure 9. Histogram of the number of aspen carvings per year for the Medicine Bow National Forest, Wyoming.

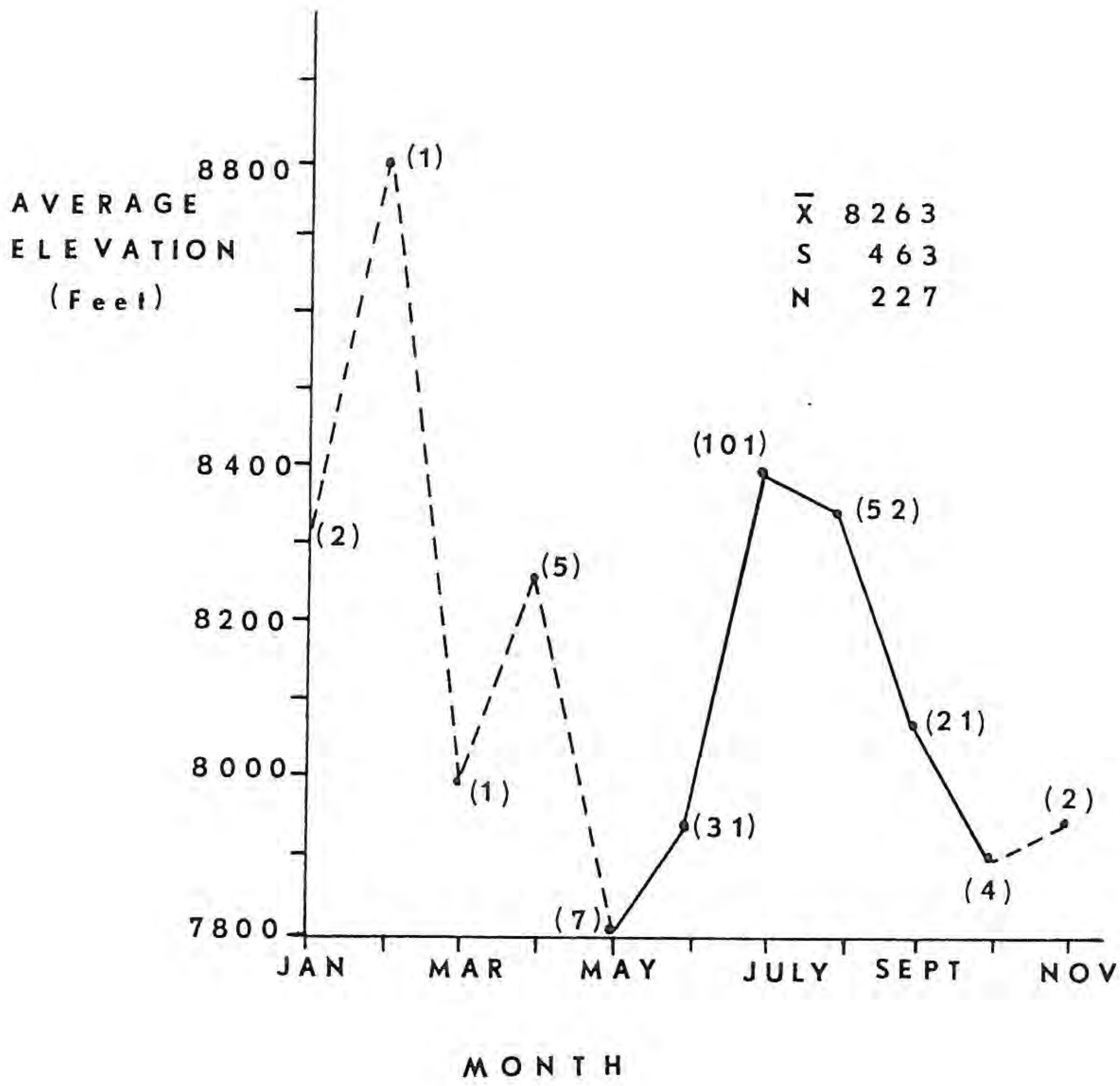


Figure 10. Mean elevation of sheepherder carvings for each month of the year.

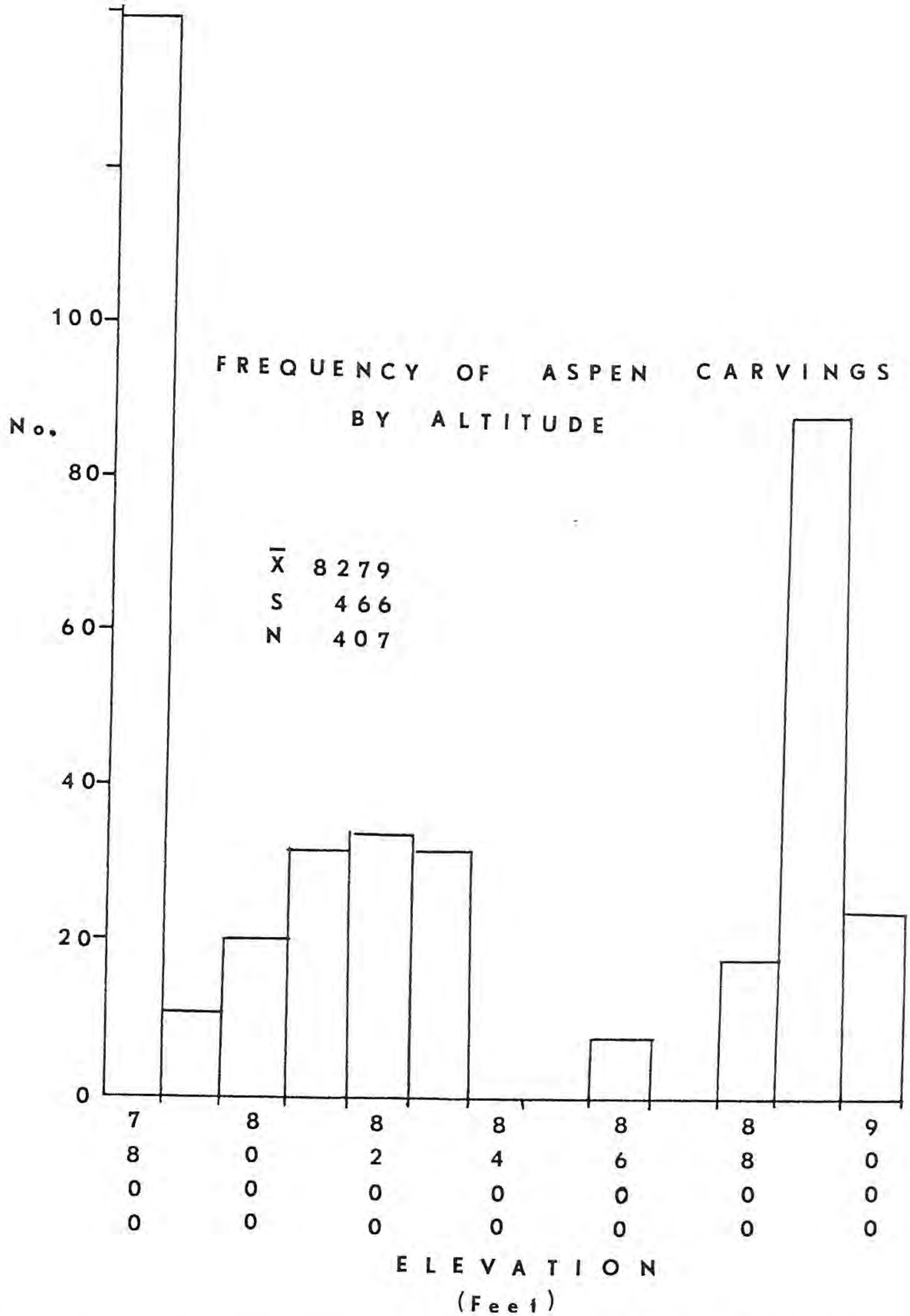


Figure 11. Frequency of aspen carvings by altitude within the Medicine Bow National Forest, Wyoming.

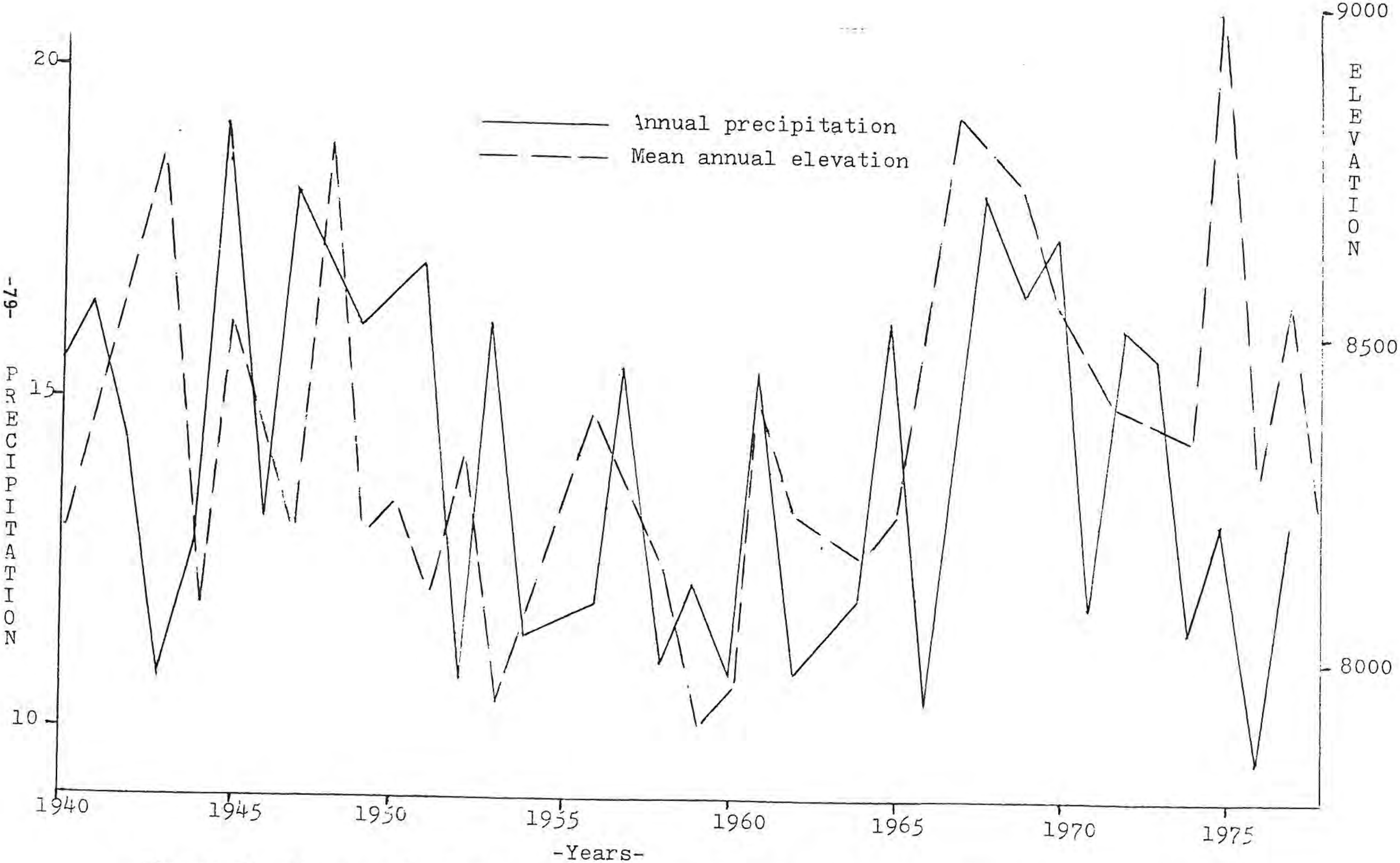


Figure 12: The correlation between mean annual elevation (in feet) of aspen carvings and annual precipitation.

May and July. After this, in September and October the sheep are moved out of the forest. This pattern is clearly reflected by the aspen carving data. The carvings increase in altitude from May through July, and then decrease after this until October. The carvings from the rest of the year are probably not sheepherder related, but instead are the work of hunters, recreationists, and other forest visitors.

This elevation change can also be seen in Figure 11. In this histogram the frequency of aspen carvings in terms of elevations are presented. The modes in this diagram may be indicative of forest usage at different seasons of the year. The 7800 foot mode may be associated with shearing and lambing during the spring, while the 8900 foot mode is probably from summer grazing activities.

Now that the accuracy of the aspen carvings has been demonstrated, these carvings can be used to evaluate the model proposed by Reher (1977). Based on this model, it would be expected that sheepherders would move up in elevation during dry years, and down in elevation during wet years. Fluctuations in precipitation and the amount of forage would also affect the number of sheep that were grazed. During wet years the number of sheep, and consequently, the number of sheepherders and their carvings, should increase. In contrast, dry periods should result in a decrease in the number of sheep, herders, and carvings. Since the response by the sheepherder probably would not be immediate, linear correlation cannot be used to test the implications of this model. Instead, precipitation and the mean annual elevation of the carvings for each year have been graphed (Figure 12). Formal statistical testing will have to await the use of cross-spectral analysis. However, visual inspection seems to indicate that precipitation and carving elevation are related in the predicted fashion. There appears to be a two to three year lag between changes in precipitation and the elevation changes that follow in response. If this is true, the sheepherders operating within the Medicine Bow National Forest are responding to fluctuations in precipitation in a way very similar to the Ramah Navajo (Jorde 1977:387). Based on these preliminary analyses Reher's model appears to be supported.

CONSLUSIONS

While sheepherder camps have significance in terms of historical and ethnographic research, only their potential for ethnoarcheological research has been examined in this paper. The utility of sheepherder and aspen carving data for testing interpretive assumptions has been demonstrated. Actural ethnographic fieldwork among sheepherders is needed to test and refine the proposed explanations of site structure and artifact assemblage variability. This fieldwork should include the mapping of sites for which the length and number of occupations can be documented, the season of occupation is known, and where the activities carried out at these sites are also remembered by the informants.

Even without the ethnographic fieldwork, the research presented in this paper can be applied to new bodies of prehistoric archeological and sheepherder data as they become available. Additional applications of the implications of this research to prehistoric hunter-gatherer sites should contribute to our understanding of the Northwestern Plains.

APPENDIX A

References Used for Constructing Table 1

Bruce 1959:35, 51, 54-55, 57, 135

Burke 1958:2

Clarke 1964:10-11

Erickson 1960:47, 75

Erickson 1979:4, 6, 18

Fawcett and Erickson *in press*

Hultz and Hill 1931:12, 56-57, 90, 94

Kilker 1978:71

Kornfeld 1980:3

Miller 1979:99-101

Sokolov 1980:94-96

Tigner and Larson 1977:245-246

Todd 1980:3-7

Utter 1964:5, 11, 21

Wentworth 1948:398

Wing 1912:114, 223

ACKNOWLEDGEMENTS

This research was supported by generous cultural resource management contracts with the USDA Forest Service, the USDI Bureau of Land Management, and the Wyoming Highway Department. Additional support was provided by the Office of the Wyoming State Archeologist and the Department of Anthropology, University of Wyoming, Laramie.

Versions of this paper were presented at the 57th Annual Meeting of the Southwestern and Rocky Mountain Division, American Association for the Advancement of Science, Greeley, April 24, 1981; and in the symposium "Prehistoric settlement and subsistence along the North Platte River in Colorado and Wyoming" at the Annual Meeting of the Wyoming Archeological Society, Sheridan, April 25, 1981.

The author has benefited from discussion with Marcel Kornfeld, Ken Erickson, Chuck Reher, Bill Latady, and many others concerning sheepherder camp archeology.

REFERENCES CITED

Barnhart, W.R.
1969 The early history of Carbon County, Wyoming. Unpublished M.A. thesis, Department of History, University of Wyoming, Laramie.

Brown, A.B., G.B. Hughes, and L.B. Erb
1980 Wagon trails and folk tales. Lincoln Printing Company, Laramie.

Brown, R.H.
1980 Wyoming: A geography. Westview Press, Boulder.

Bruce, R.K.
1959 History of the Medicine Bow National Forest, 1902-1910. Unpublished M.A. thesis, Department of History, University of Wyoming, Laramie.

Burke, G.M.
1958 Some economic aspects of wool marketing in Carbon, Natrona, and Sweetwater Counties, Wyoming. Unpublished M.S. thesis, Department of Agricultural Economics, University of Wyoming, Laramie.

Clark, R.T.
1964 A production function analysis of the Wyoming range sheep industry. Unpublished M.S. thesis, Division of Agricultural Economics, University of Wyoming, Laramie.

Day, K.C. and D.S. Dibble
1963 Archeological survey of the Flaming Gorge Reservoir Area, Wyoming-Utah. University of Utah Anthropological Papers no. 65, Salt Lake City.

Dunham, D. and V. Dunham
1977 Flaming Gorge Country: The story of Daggett County, Utah. Eastwood Printing and Publishing Company, Denver.

Erickson, D.B.
1960 A study of channels, practices, costs, and returns in the marketing of Wyoming wool. Unpublished M.S. thesis, Division of Agricultural Economics, University of Wyoming, Laramie.

Erickson, K.C.
1979 Historic artifact scatters in south-central Wyoming. Paper presented at the 1979 meeting of the Plains Conference, Kansas City.

Fawcett, W.B., Jr.
in press The antebellum period in the Stephen F. Austin Colony: Historical archeology of the George Sutherland Plantation (41JK33). The Center for Anthropological Studies, Contributions to anthropological studies, edited by A.C. Ward, Albuquerque.

Fawcett, W.B., Jr. and K. Erickson
in press Historical archeology at a Union Pacific Station in the Red Desert of Wyoming. Papers of the Conference in Historic site archeology, edited by S. South, Columbia.

Fawcett, W.B., Jr. and J. Francis
1981 An archeological survey of portions of the Medicine Bow National Forest, Albany and Carbon Counties, Wyoming. Unpublished report, Office of the Wyoming State Archeologist, Department of Anthropology, University of Wyoming, Laramie.

Fawcett, W.B., Jr. and W. Latady, and P. Hokenstad
1981 Archeological investigations along the Carter Northwest Highway project, Uinta County, Wyoming. Unpublished report, Office of the Wyoming State Archeologist, Department of Anthropology, University of Wyoming, Laramie.

Hofman, J.L.
1980 Exploring intrasite patterning and assemblage variation on historic sheepherder camps. Paper presented at the 45th Annual meeting of the Society for American Archeology, Philadelphia.

Hultz, F.S. and J.A. Hill
1931 Range sheep and wool in the seventeen Western states. John Wiley and Sons, New York.

Jorde, L.B.
1977 Precipitation cycles and cultural buffering in the prehistoric Southwest. In For theory building in archeology, edited by L.R. Binford, pp. 385-396, Academic Press, New York.

Kilker, C.A.
1978 Sheep and man: An American saga. American Sheep Producers Council, Denver.

Kornfeld, M.
1978 Euroamerican settlement systems in the Western Powder River Basin. Paper presented at the 38th annual Plains Conference, Iowa City.

Miller, M.E.
1979 Draft: Final report of a cultural resources inventory of the Corral Creek Coal production project in south-central Wyoming. Unpublished report, Powers Elevation, Archeological Division, Eagle.

Reher, C.A.
1977 Adaptive process on the shortgrass Plains. In For theory building in archeology, edited by L.R. Binsford, pp. 13-40, Academic Press. New York.

1978 The Western Powder River Basin survey. Unpublished report, Office of the Wyoming State Archeologist, Department of Anthropology, University of Wyoming, Laramie.

Sokolov, R.
1980 A matter of taste: Fleece afoot. Natural History 89: 94-98.

Thomas, D.H.
1971 Prehistoric subsistence-settlement patterns of the Reese River valley, Central Nevada. Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Davis.

Tibesar, W.L. and T.K. Larson
1980 An intensive cultural resource inventory of the Kemmerer Coal Company, North North Block, Lincoln County, Wyoming. Unpublished report, Larson-Tibesar Associates, Laramie.

Tigner, J.R. and G.E. Larson
1977 Sheep losses on selected ranches in southern Wyoming. Journal of Range Management 30:244-252.

Todd, L.C.
1980 Patterns in the distribution of sites within a historic settlement system. Paper presented at the 45th Annual Meeting of the Society for American Archeology, Philadelphia.

Utter, D.R.
1964 An economic analysis of costs, returns, and earnings for range and farm flocksheep production in Wyoming, 1960. Unpublished M.S. thesis, Division of Agricultural Economics, University of Wyoming, Laramie.

Wentworth, E.N.
1948 America's trail sheep. Iowa State College Press, Ames.

Wing, J.E.
1912 Sheep farming in America. Sanders Publishing Company, Chicago.

PREHISTORIC SETTLEMENT FACTORS IN THE MEDICINE BOW AREA OF WYOMING

by

Christian J. Zier
William M. Loker
Denise P. Fallon
John Bradley

The data used in the following analysis were gathered during an archeological survey of 34.5 contiguous sections in north-central Carbon County, Wyoming in 1980. The land lies within the proposed Medicine Bow Coal Mine lease, with present surface ownership divided among the Bureau of Land Management (BLM), Palm Livestock Company, Leo Sheep Company, and the State of Wyoming. The BLM and Palm control most of this land. Approximately 2.5 sections within the study area boundaries have been disturbed by coal or gravel mining, resulting in an actual survey area of 32 sections, or 20,480 acres (Figures 1, 2). The investigations were requested and sponsored in full by Arch Mineral Corporation.

The survey tract lies in the central portion of the Hanna Basin in south-central Wyoming, immediately southeast of the confluence of the North Platte and Medicine Bow Rivers (Figure 1). The confluence has been inundated by Seminoe Reservoir, and this body of water actually forms the northern and western boundaries of the study area. The area is basically rectangular in shape with its long axis oriented north-south (Figure 2). It is centered 15 miles northwest of the town of Hanna and falls within T23N, R83W; T23N, R84W; T24N, R83W; and T24N, R84W.

The physiography and biotic environment of the area are described in full in Zier (1981) and will only be summarized briefly here. Topography is characterized by rolling, upland hills and ridges in the north, broad playa depressions in the central area, and expanses of essentially level terrain in the south. The central and southern sectors are dissected by the large, west- or northwest-flowing intermittent watercourses of Big, Middle, North, and St. Mary's Ditches (Figure 2). Elevations range between 6360 and 6800 ft., the highest ground occurring in the north and northwest and the lowest in the south and southeast.

Four major vegetation units have been identified within the Medicine Bow tract by Mine Reclamation Consultants, Inc. (1977). These are (1) Big Sagebrush, (2) Rough Breaks, (3) Birdfoot Sagewort, and (4) Greasewood-Big Sagebrush. Detailed species lists may be found in Zier (1981:32-33). Dominant upland and open terrain species are big sagebrush (*Artemesia tridentata*), shadscale saltbush (*Atriplex confertifolia*), birdfoot sagewort (*Artemesia pedatifida*), and various grasses dominated by Indian ricegrass (Oryzopsis hymenoides), needle-and-thread (Stipa comata), and basin wildrye (Elymus cinereus). Outcrops and higher north facing slopes occasionally exhibit Rocky Mountain juniper (Juniperus scopulorum) and mountain mahogany (Circocarpus montanus). Major intermittent watercourses also produce greasewood (Sarcobatus vermiculatus) in profusion. Large game animals such as mule deer (Odocoileus hemionus), antelope (Antilocapra americana), and, formerly, bison (Bison bison) occur, although faunal lists are dominated by smaller mammals such as white tailed jackrabbit (Lepus towsendii), desert cottontail (Sylvilagus audobonii), and a variety of rodents (Wesche and Skinner 1973; Zier 1981:39-41).

The Medicine Bow survey resulted in the discovery of 411 prehistoric sites, or sites having at least a prehistoric component. The sites display tremendous variation in size, type and number of features, and artifactual composition. Certain generalizations can be made, however: (1) hearths are commonplace and are visible on the surface at 398 sites (96.8% of total); a total of 2,580 hearths or burned rock scatters was recorded during the survey. Hearth numbers on sites range from one to 50, with one being the modal figure; (2) stone circles occur infrequently in comparison with hearths but were recorded at 50 sites (12.2%). Numbers of features range from one to 29 per site, the modal figure again one; (3) ground stone artifacts (particularly manos) are relatively common, occurring on the surface at 132 sites (32.1%); and (4) surface lithic artifacts are relatively scarce, the count usually not exceeding ten items per site; 76 sites (18.5%) exhibited no lithics whatsoever. Lithic manufacture evidence is especially scant. Tools make up a relatively high percentage of those lithic artifacts which do occur and comprise mainly bifaces, edge retouched flakes, heavy bifacial choppers, projectile points, and probable utilized flakes.

Temporal placement of the Medicine Bow sites is limited at best. Diagnostic projectile points were recovered from just 62 sites (15.1% of total), and chronological data from ongoing test excavations are not yet available. The 62 dated sites exhibit 69 dated components broken down as follows: two Paleo-Indian, one Early Archaic, six Middle Archaic, 20 Late Archaic, and 40 Late Prehistoric (cf. Frison 1978). The remaining 349 sites remain undated pending further investigation.

The following analysis was presented originally in the report to Arch Mineral Corporation of the 1980 field season (Zier 1981). Most of the test is excerpted from this source from appropriate abridgement of certain portions due to considerations of space. The study was also summarized in a recent paper (Zier et al. 1981).

Locational Analysis

Locational analysis of Medicine Bow data will examine two principal aspects of settlement: first, the associations between and among sites without regard to environmental factors, i.e., the degree and location of clustering among loci of settlement; and second, the relationships between sites and their natural surroundings. The natural environment is partitioned into three categories for analytical purposes. These are vegetation (major plant communities as they are currently distributed throughout the study area); water (contemporary water sources such as playas and drainages); and other, non-hydrological features of the environment (soil, topography, slope, exposure, elevation). Due to incomplete physical data and also space limitations, the third set of variables receives the most cursory treatment.

Clustering and Inter-Site Relationships

A primary goal of the analysis is to discover an objective method for determining and describing the nature of site distribution within the survey area. This phase essentially examines sites as they occur relative to other sites, although it assumes that differential site densities reflect, at least to an extent, external factors such as intensity of resource use. By examining areas of high site density it may be possible to suggest which resources were significant and what forces conditioned activity locations.

Randomness of Distribution

The first step in describing the distribution of the sites is to determine if their distribution departs from a theoretical random distribution. There are basically two directions of departure from randomness: increased clustering of sites or a more regular distribution of sites than would be expected in a random distribution. There are a number of techniques for comparing an observed distribution with an expected random distribution, among them the variance/mean ratio and the nearest neighbor statistic (Hodder and Orton 1976:34ff). In view of the number of assumptions associated with the use of the nearest neighbor statistic, the simpler variance/mean ratio was used (Loker 1980). This test is based on the fact that in a situation where an area is divided into equal-sized grid units and a number of points are placed randomly within that area, for any particular density of points within that area the mean number of points per grid will be approximately equal to the variance of that distribution (Hodder and Orton 1976:33-34). Given this condition, the ratio of the variance to the mean will be approximately one. The variance/mean ratio of a regular distribution would be less than one while a clustered distribution will exhibit a variance/mean ratio of greater than one. The Medicine Bow prehistoric sites were tested for this property by using site frequency per section and computing the mean number of sites per section and the variance of this distribution. The resulting figures are a mean of 11.75 and a variance of 43.5. This yields a variance/mean ratio of 43.5/11.75, equal to 3.70. This indicates that the distribution of sites in the survey area departs from random in the direction of clustering.

Trend Surface Analysis

Given a clustered distribution of sites, it may be asked what areas within the survey area sites are clustering. We can then look at these areas and try to determine what features made the location of sites in these areas attractive vis a vis other areas with relatively lower site densities. To do this it is necessary to objectively discover and describe site density within the survey area by means of a technique which will depict the regional uniform trends within the area while concomitantly highlighting local areas that deviate from this trend in either a positive (increased density) or negative (lower density) direction. An ideal tool for this type of analysis is trend surface analysis (Hodder and Orton 1976:155-174; Chorley and Haggett 1965; Loker 1980). Trend surface analysis is a method of describing a statistical surface areally distributed. Broadly analogous to the contour mapping of topographic variation, trend surface analysis enables one to contour the variation in some mapped property. In this case the property is site density per unit area of prehistoric sites within the Medicine Bow survey area. The technique smoothes out minor local variation in favor of extrapolating regional trends and broad patterns of variation. This is accomplished by having individual data points contribute to the analysis more than once. In the case of quadrilateral grid units, most data points will contribute four times to the analysis.

The form of trend surface analysis performed here is essentially a quadrat method of mapping. A grid of equal size units is imposed over the area in question and the occurrence of the phenomenon being investigated is noted for each grid unit. In this case the number of sites within each grid unit was counted. The size of the grid employed is dependent on the subjective judgment of the investigator. The size of the grid used with the Medicine Bow data is the quarter section, with square units one-half mile on each side. In the first phase of the analysis, each site occurring within these blocks was counted equally and the number of sites per grid unit was noted. These counts form the basic data of the analysis. Each of these counts is then added to the count in adjacent blocks and the total placed at the intersection of the adjacent grids.

Using all prehistoric Medicine Bow sites in such a manner, a map was generated showing the frequency of sites within each grid, along with values at control points representing combined grid unit values (Figure 3). These values range from 0-13 sites one half square mile grid unit, while control point values vary from 2-27. The next step in the analysis involves determining the number of contour intervals to be used and the range of values within each contour. Geographers seek quantitative guidelines to facilitate an objective choice of the number of contour intervals to be used which reflects the amount of information regarding the mapped variable. "One rough guide may be suggested with a parallel problem in statistics...the number of classes in a histogram should not be more than five times the logarithm of the number of observations." (Haggett 1966:215). This is suggested as a rough guideline. The Medicine Bow survey data, when treated as outlined above, created 108 control points. Eight contour intervals were chosen here, falling slightly below the recommended ten intervals given this many control points. With regard to the spacing of intervals, most topographic maps use equally spaced intervals, although this may not be the best strategy for maps based on statistical distributions (Haggett 1966:215). In the case of mapping a statistical surface, it is more useful to base the contour intervals on some property of the distribution being mapped, and such a strategy was adopted. The distribution was analyzed in terms of its mean and standard deviation, and contour intervals were based roughly on this information. The mean of the distribution of control points is 11.8, and the standard deviation is 5.94. Using these figures as guidelines, it was determined that the best way to depict a surface of broad regional trends versus areas of local variation is to create unequal contour intervals based on distance from the mean. One large contour interval was chosen of values within one half of a standard deviation (higher and lower) of the mean. This created one contour interval 11.8+2.97, (8.83-14.77) which, rounded off, equals 9-15. This contour interval, then, includes all of the values which revolve closely about the mean, i.e., average values. The rest of the contour intervals are also roughly based on one-half standard deviation units. These are: less than 3, 4-6, 7-8, 16-18, 19-22, 23-25, and greater than 25. As can be seen, not all intervals are equal. Also, there are four greater-than-the-mean categories and three less-than-the-mean categories. This reflects a distribution skewed away from normal toward the high values.

Once the control points are plotted and the contour intervals chosen, contour lines are drawn. Average values are mapped as "flat", areas of higher than average densities are depicted as "hills", and areas of lower than average values as "depressions". The resulting map (Figure 4) emphasized loci of higher and lower than average densities.

Figure 4 indicates that there are three separate areas with much higher than average site density: a broad area in the north-northeast portion of the survey block, another in the central portion, and the third, a much smaller area, in the south-central region. Slightly higher than average site density is also depicted in various places. Among areas of much lower-than-average site density are the south-central area in a zone trending northwest-southeast, a localized area in the southwest corner of the project, and the west-central area. A fourth such area appears to be located in the east-central section, continuing somewhat tenuously into the northwest corner. Interpretation of these trends will be postponed while certain methodological questions are considered.

A serious problem with the trend surface procedure to this point may be the basic unit of analysis: the site. The concept of "site" is, under most circumstances, an abstraction from reality that may indicate little about the type and configuration of materials which compose it. The preceding exercise has treated all sites as equal and may have obscured potentially important sources of variation. To rectify this potential problem, the analysis was repeated using a system which differentiates among sites based on the materials recorded therein. Boiled down to essentials, Medicine Bow prehistoric sites comprise two classes of remains: artifacts and features. Sites range from no hearths to several dozen, and from isolated hearths with no artifacts to those with numerous hearths and a wide variety of artifacts. The degree of variation is considerable.

The basic goal of this portion of the study has been to measure site density and thereby gain insight into the intensity of land and resource use. To facilitate this, the following typology was adopted from the basic descriptive site classification scheme (Zier 1981:121-211) and applied to the second trend surface analysis. Using histograms of hearth and stone alignment frequency for all prehistoric sites (Zier 1981:Figures 6-J, 6-K), a point system was devised for sites based on the combined number of features present. The breakdown is sites with 1-3 features (1 point), 4-9 features (2 points), and 10 or more features (3 points). This represents a simplification of the breakdown employed in the descriptive site classification. Sites lacking features received no points. A similar scheme was employed using major artifact classes (lithics, ground stone) and tool types. Sites with one tool type (debitage included) received 1 point; with two types but only one class (either lithics <u>or</u> ground stone), 2 points; and two or more tool types including <u>both</u> classes, 3 points (see Zier 1981:Tables 6-I, 6-V, and 7-I); sites without artifacts were assigned no points. Thus, each site received a ranked value of between 1 and 6, based on features and artifacts. It should be noted that this typology does not attempt to make functional distinctions among sites, but rather is a descriptive, ordinal ranking based on fundamental cultural attributes. It is presumed, however, that the kinds and numbers of attributes tabulated do relate in some way to land and resource use.

Following assignment of a rank value to each prehistoric site, a second trend surface analysis was conducted utilizing the grid system and principles outlined above. An array of half mile square grid values from 0-47 was obtained; values of combined grid totals at control points vary from 4-91. A similar strategy was used to determine contour intervals and spacing.

The mean of control point values is 35.83 and the standard deviation, 20.94. Contour values reflecting average values equal to the mean plus one-half a standard deviation unit were set up with the average contour interval equal to 26-46. Other contour intervals reflecting this distribution were set up as follows: less than 4, 5-14, 15-25, 47-57, 58-68, 69-80 and greater than 80. Once again this distribution is skewed to the high end, and the contour intervals reflect this. The resulting map is shown as Figure 5.

What is striking about this map is its close similarity to the map shown as Figure 4, which is based on site frequency with no differentiation among sites as to size, artifactual material, etc. The minor differences that are apparent reflect the linking up or extending of some low density areas and slight shifts in the centers of the high density clusters. Upon examining the base map of site locations from which these trend surface maps have been prepared, it can be noted that the areas of high site density also seem to contain a majority of the more complex sites. However, areas of low site density do not contain only low-ranked sites. Though few of the largest sites are located in these areas (6's), medium- to high-ranked sites (3, 4, and 5) are present. There are simply too few sites in absolute numbers in these low density areas for the ranking to make a strong impact. Sites of all types cluster in the high density areas.

Summary and Preliminary Interpretation

Up to this point the analysis performed has successfully located and delineated areas of high, low and average site density. Identifying probable causes of the patterns elucidated becomes the logical next step. The most obvious factor is illustrated in Figure 2: areas of heavy disturbance by coal mining activities. In comparing this map with those of site density (Figures 4, 5), it is obvious that the broad areas of low site density in the southeastern portion of the survey area coincide closely with the zone of coal mining activity. It is clear from Figure 2 that sites are located up to the margins of the mining pits in this area; in fact, one of the areas of highest site density is located immediately to the west of these pits. From this distribution it can be stated that, without doubt, the pit has removed a wide swath of sites in the area. The same is true for the isolated area of low density in the east-central portion of the grid. This section has been mined and reclaimed, with only a small wedge of undisturbed land in the entire section. Another area of low site density that may in part reflect man-caused disturbance is the isolated locale in the west-central region. A portion of this area has been used as a gravel quarry (Figure 2). The effect of this disturbance is less clear-cut than in previous cases because some relatively undisturbed adjacent areas also have low site density.

In cases such as this, and in the cases of other regions of high and low site densities, we must look to other factors such as features in the natural environment that may have conditioned the location of sites and activities by prehistoric groups. While specific environmental factors will be discussed in following sections, suggestions as to causal factors will be made here. Elevation figures for the survey area as a whole do not indicate extreme topographic variation. However, local physiographic variability does exist due to a large extent to the cutting action of numerous intermittent drainages. The largest (Big, North, Middle and St. Mary's Ditches) drain westward into the North Platte River through the south and central portions of the area. Topographic variability is most extreme in the northern part of the area, with rugged, deeply incised drainages along the margin of Seminoe Reservoir. The drainages to the northeast are tributary to the Medicine Bow River while those to the northwest flow into the North Platte. The two drainage catchment areas are separated by a broad, fairly level ridge. In addition, the central survey area exhibits several playa lakes a mile or more in diameter.

On the basis of trend surface analysis, it appears generally true that the locations of drainages are strong conditioners of prehistoric site location. In viewing Figures 4 and 5 relative to Figure 2, major clusters of high site density are situated along prominent intermittent watercourses. Areas of lower site density tend to occur on the broad uplands away from major drainages (not including localities of recent human disturbance), an example being the higher ground separating the Medicine Bow drainages in the northeast survey area from the drainages flowing into the large playa and the North Ditch-Big Ditch system in the central and southern survey area. In areas of average site density, the pattern of distribution appears to be linear along these drainages. Confluences of major drainages (e.g., North and Big Ditches) exhibit high density values, as do areas overlooking major playas in the central survey area. Finally, in the broken country in the northeast survey area, close to the confluence of the North Platte and Medicine Bow Rivers, sites appear to cluster at the heads of drainages, with the majority in the watercourses which flow into the latter river.

In sum, prehistoric sites in the broad Medicine Bow survey tract can be shown to vary greatly in diversity with specific areas of site clustering. Ranking sites on the basis of artifact and feature characteristics, as compared with analysis with undifferentiated sites, does little to alter contour lines of site density. Zones of highest site density appear without exception to correspond with hydrologic factors: major ephemeral drainages (particularly confluences), playas, and heads of smaller intermittent drainages close to the North Platte and Medicine Bow Rivers. The question of whether water can be considered a direct causal factor, or if water-related resources (e.g., specific vegetation resources) are more important in determining site location, will be discussed below.

Site Location and Vegetation Communities

Analysis of settlement relative to plant distribution has become standard procedure with most archeological reports of regional scope. It is generally conducted under the assumption that vegetation directly affected the placement of human activity within the area, or that vegetation at least is a fairly accurate and measurable reflection of other factors affecting settlement (or a combination thereof), e.g., elevation, exposure, topography, etc. Distinguishing between direct cause and secondary associations due to the other potential factors may be the most difficult part of the analysis. A critical assumption is that vegetation communities have remained relatively constant since prehistoric times--or that the degree and nature of change can be ascertained.

Vegetation in the Medicine Bow project area has been mapped in four major units (above). Firsthand observation suggests that boundaries between adjacent zones are at times indistinct. Coverage of the survey tract by the vegetation study is not complete, amounting to approximately 14,960 acres, or 23.38 contiguous sections (67.75% of the area of the archeological survey). Main areas within the tract which are not well covered are: (1) most of the eastern edge of the area, in a strip one mile wide; (2) parts of the south-central and west-central survey area, comprising lands bordering Big Ditch in the vicinity of its confluence with Seminoe Reservoir; and (3) the northwest corner of the survey area, bordering both the North Platte and Medicine Bow channels of Seminoe Reservoir. The extent of vegetation mapping is evident in Figure 6.

The big sagebrush zone is the most extensive within the area that has been mapped, making up 57.4%. It tends to occur in deeper, non-saline soils in relatively flat, open terrain which excludes, but may border upon, major drainages and playas. Much of the country in the north and central survey areas comprises this zone. Greasewood-big sagebrush accounts for 9.7% of the area and tends to be confined to saline soils along major drainage bottoms and in playas, principally in linear zones in the south and central portion of the tract. Birdfoot sagewort (16.1%) is not as clearly defined locationally as other zones, commonly bordering the big sagebrush and rough breaks zones and in some cases found mixed or in association with them. Birdfoot sagewort occurs in small units throughout the survey area, usually on gentler slopes. The rough breaks zone (16.8%) is prominent in upland country, in shallow, rocky soils of moderate to steep slopes. It occurs most commonly in the north and northeast survey area but is scattered throughout the tract (Figure 6).

The Chi-square (X^2) statistic was used to evaluate the significance of differential site distributions relative to vegetation zones. Sites were tabulated using various criteria which crosscut one another from one test to the next. Five such frequency comparisons were attempted although Chi-square could not be used in all cases due to progibitively low expected frequencies in some cells (Siegel 1956:46). Because only partial vegetation coverage is available, not all sites are included in this portion of the analysis. The total number of sites used is 233.

All Prehistoric Sites

Prehistoric sites as a group are distributed with respect to the four zones as follows (using abbreviations from Figure 6):

B - 30 (37.5)
T - 128 (133.7)
GB - 18 (22.6)
RB - 57 (39.1)

Expected frequencies appear in parentheses. The X^2 statistic tests the null hypothesis that no significant difference exists in the occurrence of sites relative to vegetation zones. Expected frequencies (i.e., those that would occur if the distribution of sites was random) in this case are determined by multiplying the total number of sites (233) by the respective percentages of each of the four zones. Significance level is arbitrarily set at $0.5 > p$, where p=probability of occurrence (cf. Siegel 1955). It is evident that actual site frequency in the B, T, and GB zones is lower than expected frequency, but much higher in the RB. X^2 = 10.87 (3 d.f.), and is significant by the chosen criteria.

Sites With Ground Stone

Prehistoric sites with ground stone (77 in number) are distributed as follows:

B - 10 (9.9)
T - 44 (42.3)
GB - 6 (5.9)
RB - 17 (18.9)

For this and the remaining tests, expected frequencies are computed not on the basis of vegetation zone percentage but rather the distribution of prehistoric sites as a group (previous test). For example, the expected frequency of ground stone sites in T (above) is determined with:

$$128/233 \times 77 = 42.3$$

where 128 is the number of prehistoric sites in the T zone, 233 is the total number of prehistoric sites, and 77 is the total number of sites with ground stone. In this case X^2 = 0.26 (3 d.f.), not at all significant. It can be seen that actual frequencies in all cases deviate very little from expected frequencies.

Sites by Tool Diversity Index

Differential distribution of sites according to tool diversity index (Zier 1981:334-341) was computed as follows. A straightforward diversity index was employed in which the number of tool categories present on the surface of a site was tabulated. Debitage is counted as a single tool category (Zier 1981: Table 7-I). Sites were divided somewhat arbitrarily into low (6 or below) and high (7+) index groups. Sites with low values (233 total) were then weighed against prehistoric sites overall. Use of either the high or low group would theoretically have achieved the same end; however, the low group is higher in membership and therefore more amenable to X^2. The distribution is as follows:

B	-	30	(28.8)
T	-	122	(122.4)
GB	-	17	(17.2)
RB	-	54	(54.6)

$X^2 = 0.05$ (3 d.f.) and again is not significant, with observed frequencies very closely approximating expected frequencies.

Sites with Stone Circles

If sites with stone circles are tabulated (30 total), computation of X^2 is not possible due to violation of minimum expected cell frequencies. The distribution is as follows:

B	-	2	(3.9)
T	-	15	(16.5)
GB	-	2	(2.3)
RB	-	11	(7.4)

Frequency in the rough breaks zone is evidently higher than expected although the sample is small and statistical significance not demonstrable.

Sites Ranked by Hearths

Using the descriptive site typology in Zier (1981:121-211), prehistoric sites were subdivided on the basis of numbers of hearths. Four groups are identified: 1-3, 4-8, 9-14, and 15 or more hearths. In order to comply with minimum expected cell frequency requirements, the latter two groups are combined into one (9+ hearths). The distribution of sites (227 total) is as follows:

	1 - 3	4 - 8	9 +
B	16 (17.4)	11 (10.8)	3 (8.4)
T	64 (62.0)	34 (38.5)	28 (29.8)
GB	12 (10.5)	4 (6.5)	2 (5.0)
RB	16 (18.1)	18 (11.3)	19 (8.7)

X^2 is 23.65 (6 d.f.), significant at the .05 level. The greatest discrepancies between observed and expected frequencies are (1) in the B zone, low frequency of site with 9+ hearths; and (2) in the RB zone, both sites with 4-8 and those with 9+ heraths are high in frequency.

Summary and Preliminary Interpretation

Prehistoric sites as a single group have been shown to be significantly non-randomly distributed within the survey area with regard to mapped vegetation units. The rough breaks stratum, occurring primarily in the north and northeast survey area, exhibits an inordinately high site frequency at the expense of the other three zones. This information correlates roughly with results of trend surface analysis which indicates much greater than average density in the north-northeast area (among others). Other tests yielded disappointing results. Prehistoric sites as defined on the basis of (1) ground stone and (2) tool diversity do not exhibit distributions skewed toward particular vegetation units. Sites defined on the basis of stone circles are not amenable to Chi-square scrutiny of frequency distributions due to technical limitations of the statistic. Stone circle cites do appear to favor the rough breaks zone although absolute numbers are small. Only prehistoric sites as distinguished on the basis of hearth numbers display significant departure from the theoretical random distribution: generally, sites with larger numbers of hearths are unusually common in the rough breaks and uncommon in the birdfoot sagewort zones.

The immediate impression is that site locations in the macro sense--relative to broadly mapped units--are not closely correlated with vegetation. This may be interpreted in a number of ways: (1) that site location is in fact not conditioned by vegetation; (2) that modern vegetation communities are a poor reflection of past conditions; (3) that mapping of extant vegetation by the consultants is not sufficiently sensitive to permit locational correlations, particularly as pertains to micro-environmental conditions; or (4) that significant associations (in particular, prehistoric sites with the rough breaks zone) are actually a reflection of one or more hidden variables to which vegetation is also sensitive, e.g., topography or proximity of water. The third and fourth possibilities are suspected of being the strongest, and will be described in a following section.

Water Resources

In a moisture-poor area such as the Medicine Bow Mine, water must have had a major impact on site location (discussion, above). A distinction must be drawn, however, between "macro" and "micro" settlement: whereas site density in the survey tract appears to be high in comparison with the area as a whole, at no point within the tract is permanent water (North Platte River or Medicine Bow River) greater than 5 miles distant and for many sites it is considerably closer. It may be concluded that the presence of these watercourses does condition site density. A situation of "overload" may exist, however: accessibility to water at any time and from any place within the area is so good that it fails to explain specific locational patterns. Micro settlement would thus appear to be sensitive to microenvironmental factors which may or may not be water-related.

It is interesting to note that although a direct relationship does seem to exist between site location and water sources, the main areas of site density do not necessarily correspond with those exhibiting permanent water. In the northeast survey area, where site density is high close to the Medicine Bow channel of Seminoe Reservoir, specific locations near the heads of side drainages were chosen. In the central and south survey areas, preferred locations are adjacent to prominent but ephemeral watercourses and playas. This again suggests that variables related to those water sources, rather than the water itself, were operative.

Proximity of sites to certain water sources is well demonstrated through trend surface analysis (above). Data pertaining to distance of sites from (1) nearest permanent, and (2) nearest available water (Zier 1981: Table 6-II) indicate a rather confused situation which probably owes to the condition of "overload" referred to above. Permanent water is in all areas close at hand; and minor intermittent drainages (third and fourth order) are so frequent throughout the area that even those sites not situated close to a playa or one of the major ditches are rarely more than a few hundred meters away.

Non-Hydrologic Variables

This section will examine the apparent effects of five variables on site location: soil, topography, slope, exposure, and elevation. Topography, slope, and exposure are considered to be micro-environmental factors which may as much as anything be indicative of specific preferences (for reasons of comfort, etc.) within a zone of habitation. Elevation is regarded as a potential secondary, or corroborative, indicator of variables more directly affecting site location (e.g., topography, hydrology). The effect of soil characteristics on non-sedentary (i.e., non-agricultural) settlement is often unclear although soils may be excellent secondary indicators of other, causal variables (vegetation, hydrology) as well as micro-environmental determinants of settlement.

Soil units within the mine plan boundaries have been recently mapped but detailed results (including maps) were not available at the time of analysis. Any attempt to demonstrate statistical correlations between sites/site types and major soil types must therefore await further analysis.

Sandy soils are found throughout the project (Zier 1981: Figure 2-E) although they tend to occur with greater regularity in the central, south-central, and southeastern areas. In particular, eolian (wind-deposited) sands are common. Eolian deposition may take place in a variety of topographic situations but at Medicine Bow most often is associated with major playa basins (e.g., trending north-south through Sections 19, 18 and 7 in the central area) or occurs as dune ridges overlooking troughs carrying major intermittent drainages (e.g., along Big Ditch in the southeast and south-central areas). Eolian deposits generally are semi-stabilized to stabilized and nearly always exhibit vegetation. The crests of some dune ridges are among the most densely vegetated localities in the survey tract.

Sites appear to occur regularly in such settings or, in many instances, adjacent to major dune areas. The latter situation is especially true of the vicinity of the major playas in the central survey area. Numerous ribbon-like, NE-SW trending dune ridges occur in the northeastern region. These features mirror the orientation of the indigenous bedrock topography and are interspersed with parallel intermittent drainages. Sites commonly occur here as well and often tend to be situated near the heads of minor drainages (discussion, above). The propensity of prehistoric sites to be located in sand dune settings may be cited as the single greatest reason that cultural remains throughout the survey area are poorly defined. Although the inherent instability of dunes does tend to expose sites through erosion (particularly wind deflation) and thus allow initial recognition, the same quality often obscures materials to the extent that vertical and horizontal limits of sites cannot be ascertained.

Nine topographic descriptions were used for on-site locations (Zier 1981:6-II). These are as follows, with percentages of prehistoric sites claiming that setting in parentheses: dune (20.0%), ridge/ridge slope (41.0%), swale (2.4%), hill/hilltop (6.1%), floodplain/alluvial plain (6.3%), gentle slope or open plain (14.1%), terrace or bench (5.6%), arroyo bank (2.7%), and sandstone bluff or escarpment (1.5%). An effort was made in the field to record topographic settings in a consistent manner although some overlap invariably occurs among categories. In particular, the distinction among dune, ridge/ridge slope, and hill/hilltop is not always clearly drawn.

In an area which is not noted for physiographic variability and relief, it is striking that 67.1% of sites occur in dune/ridge/hill terrain. The third category (swale) is often one of irregular terrain as well, for example a shallow depression between dune ridges. Open topography/gentle slope accounts for just 14.1% of sites. Actual floodplain situations are relatively rare (6.3%) (or the evidence of such has been buried or destroyed) despite the fact that settlement in close proximity to watercourses is relatively dense. It should be noted that association with eolian topography is greater than dune site frequency (20.0%) alone suggests due to the aforementioned ambiguity among certain categories. In fact, most of the ridges and hills in the survey area exhibit eolian deposits and many are strictly eolian-based features.

On-site slope was measured in degrees with a pocket transit. For purposes of tabulation, an average figure is taken for sites with variable slope readings (e.g., 1-5° is recorded as 3°). Slope ranges from 0° (level) to 20°, averaging 3.8°. Sites on strictly level ground constitute just 1.0% of total, although another 11.2% are situated in terrain which is partially level and partially sloped. Sites on 1° slopes make up 9.8% of the total. The modal slope is 2° (24.4%) with figures beyond it dropping sharply in a faily smooth curve: 3° (16.8%), 4° (19.5%), 5° (9.5%), 6° (8.5%), 7° (2.2%), and 8° or greater (8.3%). Obviously, the earlier tabulations of topographic preference are buttressed by these figures. Sites rarely occur on level ground and most frequently are found on slopes between 2° and 6° (78.7% of all prehistoric sites).

Direction of exposure was recorded for all sites and indicates distinct preferences. In situations where exposure covers a range, for example south to east, an intermediate or average direction was tabulated (in the example case, southeast). The compass was divided into four quadrants (N, S, E, and W); the west quadrant comprises 90° between NW and SW, etc. The numbers of sites within each quadrant were then tabulated. Sites falling on a boundary between quadrants (exactly NE, SE, NW, or SW) were counted as one-half in each quadrant. As an example, 26 sites were recorded with NE exposure, 13 of which are included in the N quadrant count and 13 in the E quadrant.

Fully 47.1% of prehistoric sites are in the S quadrant, i.e., exhibit exposure from SW to S to SE. The next most common is E (24.1%), followed by N (16.3%) and W (12.6%). The two most frequent single directions of exposure are S (29.1% of all sites) and SE (12.8%). In much of the study area, topography trends NE-SW (ridges with parallel intervening drainages) so that exposure of any given locality, whether on a ridge slope or close to a drainage, will have to be either NW or SW (roughly). The above figures indicate a definite favoring of south- to east-facing locations at the expense of north- to west-facing locations. Site exposure is regarded here as a preferential factor, at least in localities that were occupied for some duration. The Medicine Bow data are most likely indicative of efforts to escape from winds which, almost perpetually, blow from the west.

Elevation appears to be a rather sensitive secondary indicator of site location. Prehistoric site elevations span the 440-foot range from 6360 to 6800 feet. Average site elevation is just under 6500 feet. Elevations were tabulated in 50-foot intervals beginning with 6350-6399, 6400-6449, etc. and frequencies calculated. The modal range is 6400-6449 (25.1% of all sites), followed by 6450-6499 (21.4%) and 6500-6549 (22.8%). These three intervals collectively contain 69.3% of all sites in their 150-foot range. Occurrences of sites above the 6550-foot contour are sharply reduced, accounting for just 21.9% of total.

While collective data on site elevations do, to an extent, simply mirror elevations of the project area as a whole, it is noteworthy that nearly 70% of all sites occur in a 150-foot elevation range despite the approximately 500 feet of vertical relief in the area as a whole. Much of this can probably be explained by the fact that the 6500-foot contour surrounds major playas in the central project area, while dune topography directly associated with major intermittent watercourses in the central and south areas generally occurs between 6400 and 6500 feet.

Summary and Conslusions

On the basis of the above, the following may be summarized about prehistoric sites in the Medicine Bow survey area:

(1) Sites are distributed non-randomly with respect to one another, with the departure from randomness tending toward clustering;
(2) Specific areas of much greater and lesser than average site density can be identified on a "cultural contour map" through trend surface analysis;
(3) Sites as a group display significant non-random distribution with respect to four major vegetation strata, skewed toward high density in the rough breaks zone and low in the other three;
(4) Sites as ranked according to numbers of hearths display significant non-random distribution with respect to vegetation strata, those exhibiting large numbers of hearths occurring frequently in the rough breaks but infrequently in the birdfoot sagewort zone;
(5) Sites as defined on the basis of (a) stone circles, (b) tool diversity index, and (c) ground stone are not differentially distributed relative to vegetation strata;
(6) Sites as a group tend to be spatially associated with water sources, of a complete range of types: (a) the permanently flowing North Platte and Medicine Bow Rivers (particularly the latter), (b) heads of small, inter-

mittent tributary drainages to the North Platte and Medicine Bow, (c) major intermittent tributaries (Big, North, Middle and St. Mary's Ditches); and (d) playa lake basins;

(7) Sites tend to be associated with eolian sand deposits;

(8) Sites tend to occur on hills/dunes/ridges rather than open plains, alluvial plains, arroyos, terraces, or escarpments;

(9) Sites rarely occur on level terrain, most frequently occupying 2°-4° slopes;

(10) Sites tend to occur on slopes with southern, southeastern, or eastern exposures; and

(11) Sites occur most frequently between the 6400- and 6550-foot elevation contours.

Any discussion of prehistoric settlement factors must include a caveat, and no exception in taken here. Locational interpretations tend to be rather simplistic, a reflection more of the data than of the archeologists who work with it. In any locational study, certain factors will be easy to identify and others obscure--although perhaps equally important. As noted, our ability to distinguish between primary, causal variables and secondary variables is often impeded. Finally, in a study such as Medicine Bow, we find it impossible, without excavation, to demonstrate comtemporaneity among groups of sites.

Perhaps the most fruitful way of viewing settlement at Medicine Bow is by again recalling the distinction between macro and micro settlement. The first veiws generalized locational trends, for example differential site densities across an area, while the latter deals with specific locational data of individual sites. Macro settlement is probably conditioned by key resources or, in some cases, combinations of resources, in a general area. Conversely, micro settlement is likely to be controlled by practical factors such as exposure (shelter from wind, heat), need for a soft substrate for sleeping or for excavation of hearth pits, etc.

The concept of site catchment (Vita-Finzi and Higgs 1970) is relevant here in that it directs attention away from pinpoint site locations and toward consideration of the general area in which a site occurs. A realistic measure of the exploitable resources important in affecting a site's position are probably those which could have been reached in a half-day walk. Lee (1968:35) notes, for example, that the Kung Bushmen of southern Africa can routinely travel 12 miles on foot in a one-day round trip foray, i.e., have a day range within a 6-mile radius of camp location. If this figure is used as a guideline at Medicine Bow, it becomes apparent that any portion of the project area is within easy reach of any other (in addition to a good deal of surrounding territory), and that permanent water is never further than a half-days's walk. Even if the day range were halved to a 3-mile radius, one must be struck by the mobility of hunter-gatherers and the amount of land within easy reach at any particular time.

The concept of "overload" with regard to water resources applies in this context. Site density appears to be abnormally high at Medicine Bow in comparison with some nearby areas (although data from some of the other surveys may not be totally comparable due to differences in field methodology), a fact which can probably be explained in terms of proximity to permanent water. In fact, the Medicine Bow tract occupies an enviable position, given the arid condition of the environment, in that it adjoins the confluence of two major perennial streams and is bordered by them on two sides. Whereas water can perhaps explain overall site density in the project area, it probably does not have a great effect on actual site location: it is simply too accessible from all points.

The three most notable variables which correlate with site location in a general sense are water sources within the area (various types), eolian sand, and vegetation as mapped in broad, comprehensive units. Conclusions about these variables are as follows: water _per se_ within the project area is probably _not_ a prime determinant of settlement but is considered to be _the_ single greatest indirect factor. Given the proximity of permanent water, there would seem to be no impetus for selection of site locations near ephemeral sources except at specific times; and minor drainages, major intermittent tributaries to the Platte, and playas contain surface water for a relatively small percentage of the year. Rather, prehistoric peoples were probably keying on resources which sprang from intermittent water sources. Artifacts found on sites indicate that wild plant food processing was a frequent occupation in the area, and it is probable that localized hydrologic features--localities with occasional surface water, and, in some cases, constant ground water--produced edible grasses (and possibly other economic plants) in greater abundance than elsewhere. These areas would also have been favorable for hunting of certain animals.

Eolian sand frequently has been shown to correlate strongly with site location on the Northwestern Plains. Although explanations vary, a strong possibility is the proclivity of dune areas (if vegetated) to yield economic grasses and, in particular, a more complete mix of grass species than other types of settings (Litzinger 1978). This again seems logical in terms of the Medicine Bow data given the ubiquity of grinding stones on sites. Settlement near hydrologic features and in dunes is difficult to distinguish in parts of the project area because of the tendency of eolian deposits to occur near water (particularly playas but also major intermittent drainages).

Ironically, principal vegetation units as mapped in the mine area are not viewed as primary conditioners of site location despite the apparent emphasis on wild plant exploitation. Significant association between sites as a group and vegetation units has been shows although such correlations cannot be demonstrated when sites are broken down according to various criteria.

The specific associations which do show up--first, between the rough breaks zone and sites overall, and second, between rough breaks and sites with large numbers of hearths--are probably secondary in that the rough breaks occurs mainly in one area of the project (northeast), tends to reflect a specific type of topography (broken, hilly, with heads of tributary drainages to permanent water sources), and exists in close association with other zones. In all likelihood, vegetation zones as mapped (Figure 6) are not sufficiently sensitive to key species of prehistoric economic importance to be worthwhile indicators of locational characteristics. Although major drainage bottoms (e.g., Big Ditch) and playas may be closely associated with vegetation (greasewood-big sagebrush stratum), archaeological evidences of settlement are unlikely to be directly correlated with this zone because (1) site locations would often have been out of the drainage or playa proper, in adjacent areas; and (2) sites within the drainages and playas were soon washed away or buried by sediment.

Other consistent settlement attributes, such as southern to eastern exposure, are believed to be largely reflective of specific locational preferences. It should be borne in mind, however, that a small site representing a single, short-term activity may be situated as it is as a result of a fortuitous event, e.g., killing an animal in a particular place.

In summary, site location at Medicine Bow may be tied principally to the economic activities of plant food collecting and processing, and reflect selection for water sources, dunal areas, and, by inference, areas of high yield in terms of edible grasses and other plants. It may be concluded that occupation occurred mainly during the warmer months of the year. Hunting is apparent although on the basis of the surface artifact assemblage it appears to have been of secondary importance. Unfortunately, temporal control of the sites is quite poor, and given the current data base it is not possible to trace changes through time. One hopes that future research in the Medicine Bow Coal Mine area will provide the information needed to recognize those changes.

ACKNOWLEDGMENTS

We wish to acknowledge the support of Arch Mineral Corporation and, in particular, Mr. David C. Porterfield, Environmental Engineer. Arch Mineral personnel from the Medicine Bow Mine who merit thanks are Jim Felber, Tim Rohrbacher, and Joe Tucker. Project field participants other than the authors were James A. Brunette, Laura Gerwitz, Bruce Gothar, J.T. Mason, Dennis McDougall, Jill Mohr, John Mohr, Jeffrey C. Smith, and James A. Truesdale. Line drawings were executed by J.T. Mason. Others who lent advice or assistance include Michael D. Metcalf, Irene Conroy, Sally J. Metcalf, Mark E. Miller, and David Reiss.

REFERENCES CITED

Chorley, R.J., and P.H. Haggett
1965 Trend Surface Mapping in Geographical Research. Transactions of the Institute of British Geographers 37:47-67.

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

Haggett, Peter H.
1966 Locational Analysis in Human Geography. St. Martin's Press, New York.

Hodder, I.H., and C. Orton
1976 Spatial Analysis in Archaeology. Cambridge University Press, Cambridge.

Lee, Richard B.
1968 What Hunters Do for a Living, or, How to Make Out on Scarce Resources. In, Man the Hunter, edited by R.B. Lee and I. DeVore. Aldine Publishing Company, Chicago.

Litzinger, William J.
1978 Series Composition of the South Haystack Study Area Vegetation Associations. In, Archaeological Investigations at the Proposed South Haystack Mine, Uinta County, Wyoming, 1976-1977, edited by M.D. Metcalf and C.J. Zier. Western Wyoming College, Rock Springs.

Loker, William M.
1980 Locational Analysis of the Medicine Bow Archaeological Site Survey Project. Manuscript, Department of Anthropology, University of Colorado, Boulder.

Mine Reclamation Consultants, Inc.
1977 Vegetation Inventory, Arch Mineral Corporation, Medicine Bow Lease, Hanna, Wyoming.

Siegel, Sidney
1956 Nonparametric Statistics for the Behavioral Sciences. McGraw-Hill Book Company, New York.

Vita-Finzi, C. and E.S. Higgs
1970 Prehistoric Economy in the Mt. Carmel Area of Palestine: Site Catchment Analysis. Proceedings of the Prehistoric Society 36:1-37.

Wesche, Thomas A., and Quentin D. Skinner
1973 An Environmental Inventory of Present Conditions Coincident with the Enlargement of Seminoe Dam and Reservoir. Water Resources Research Institute, University of Wyoming, Laramie.

Zier, Christian J. (editor)
1981 Report of a Class III Archaeological and Historical Survey of the Medicine Bow Mine in Carbon County, Wyoming. Metcalf-Zier Archaeologists, Inc., Eagle, Colorado.

Zier, Christian J., William M. Loker, Denise P. Fallon, and John Bradley
1981 Prehistoric Settlement Factors in the Medicine Bow Area of Wyoming. Paper presented to meeting of the Wyoming Archaeological Society, April 24, 1981, Sheridan, Wyoming.

Figure 1: Map of Wyoming showing Hanna Basin
and Location of Project Area

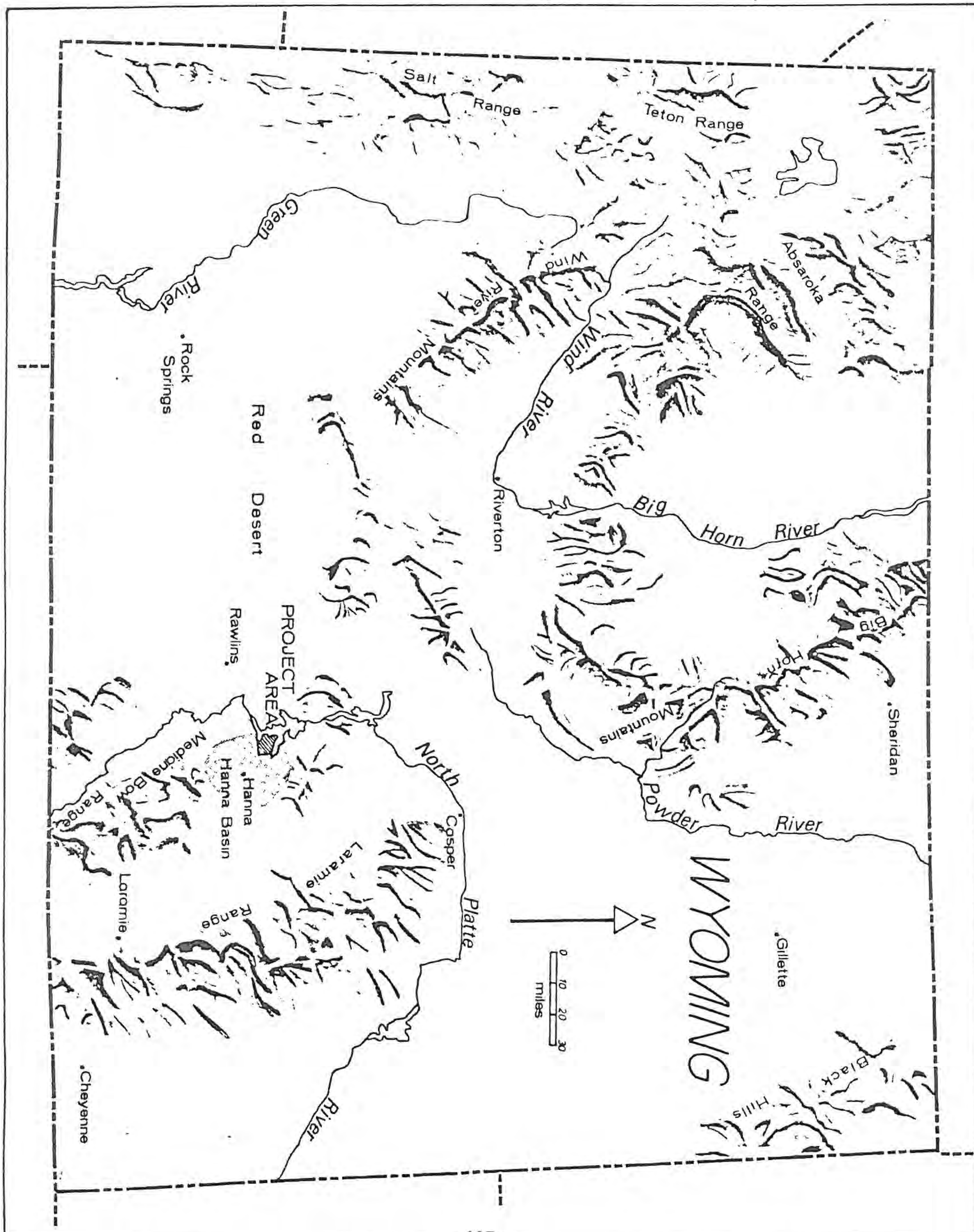


Figure 2: Medicine Bow Project Prehistoric Site Location

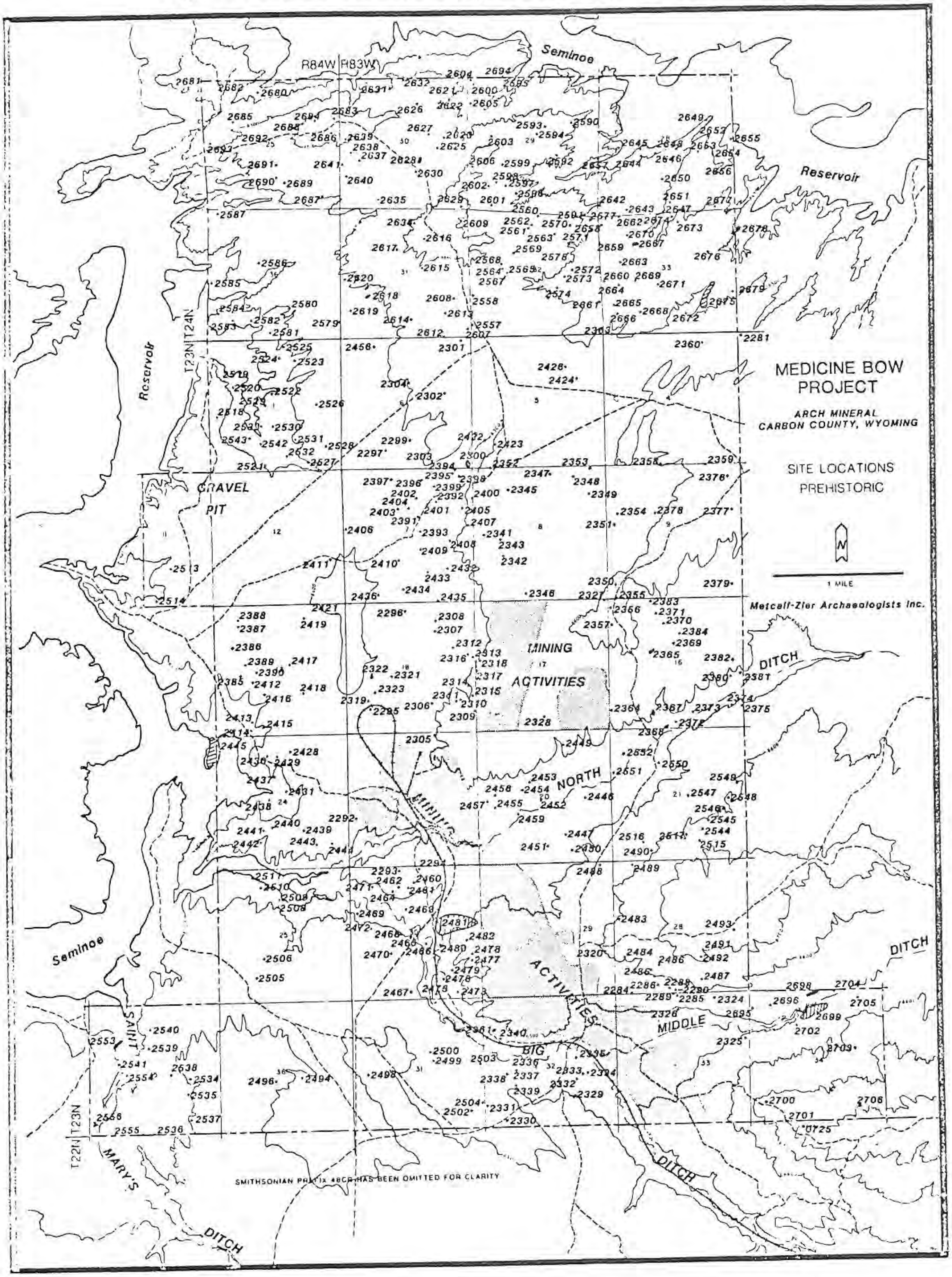
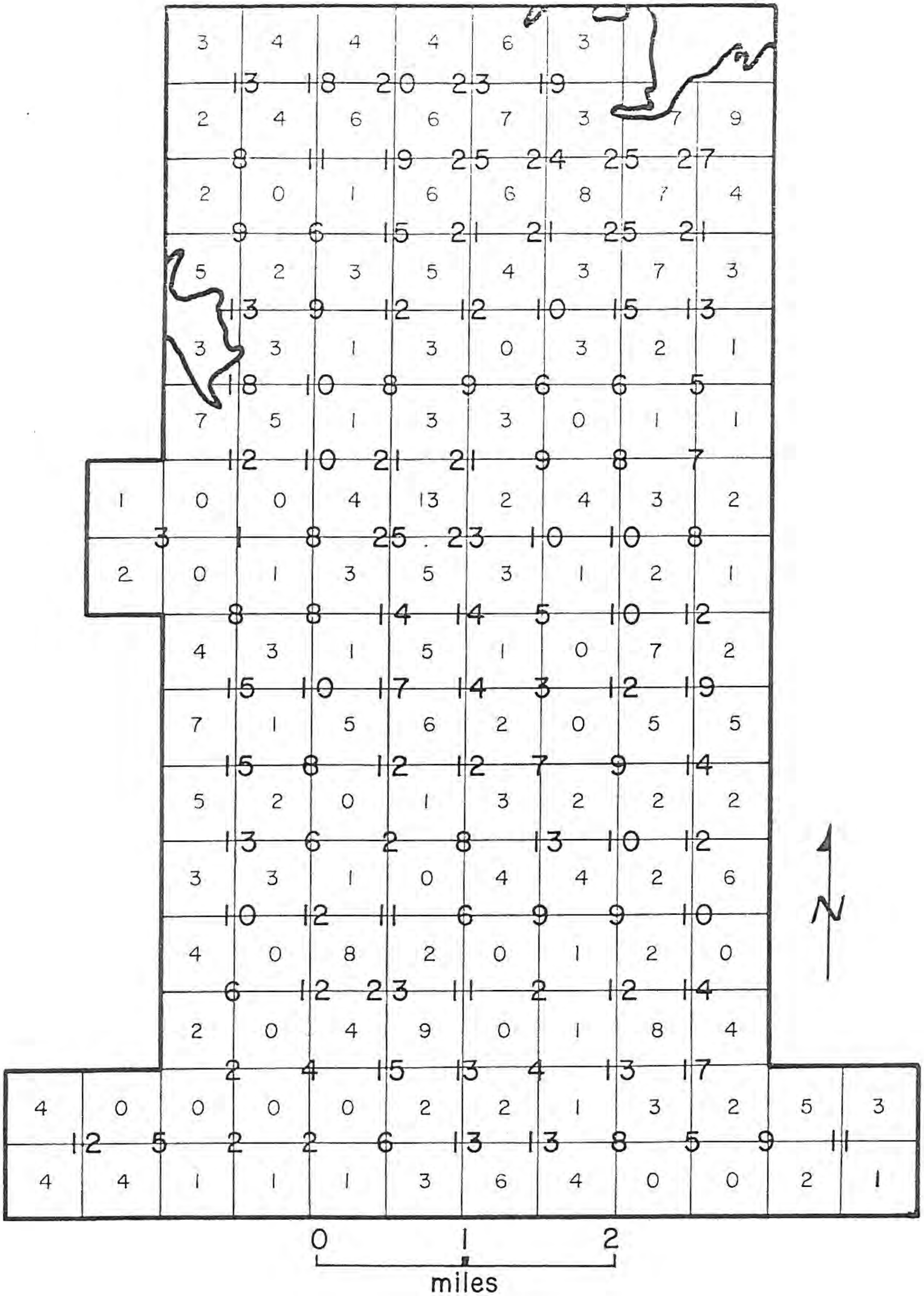
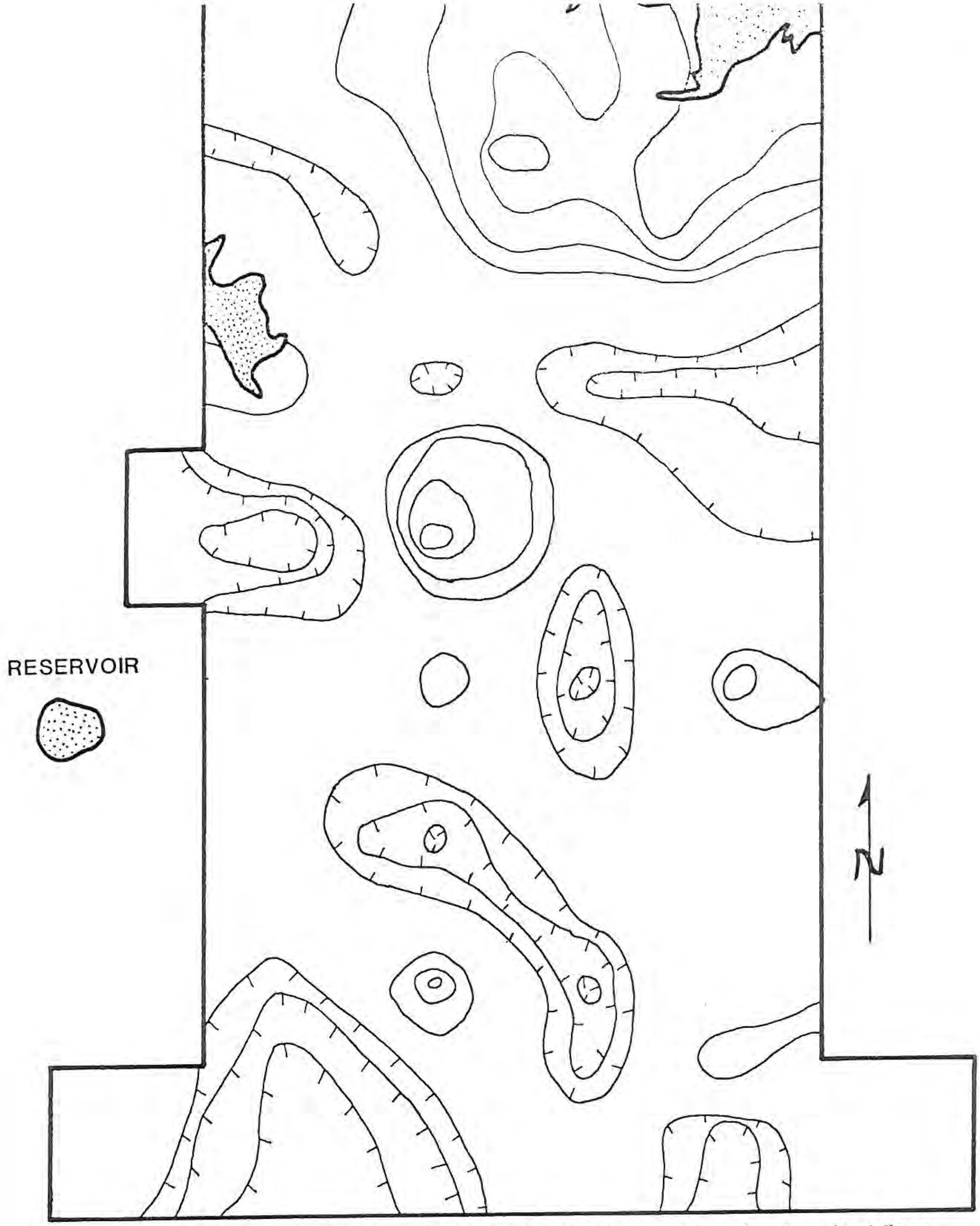


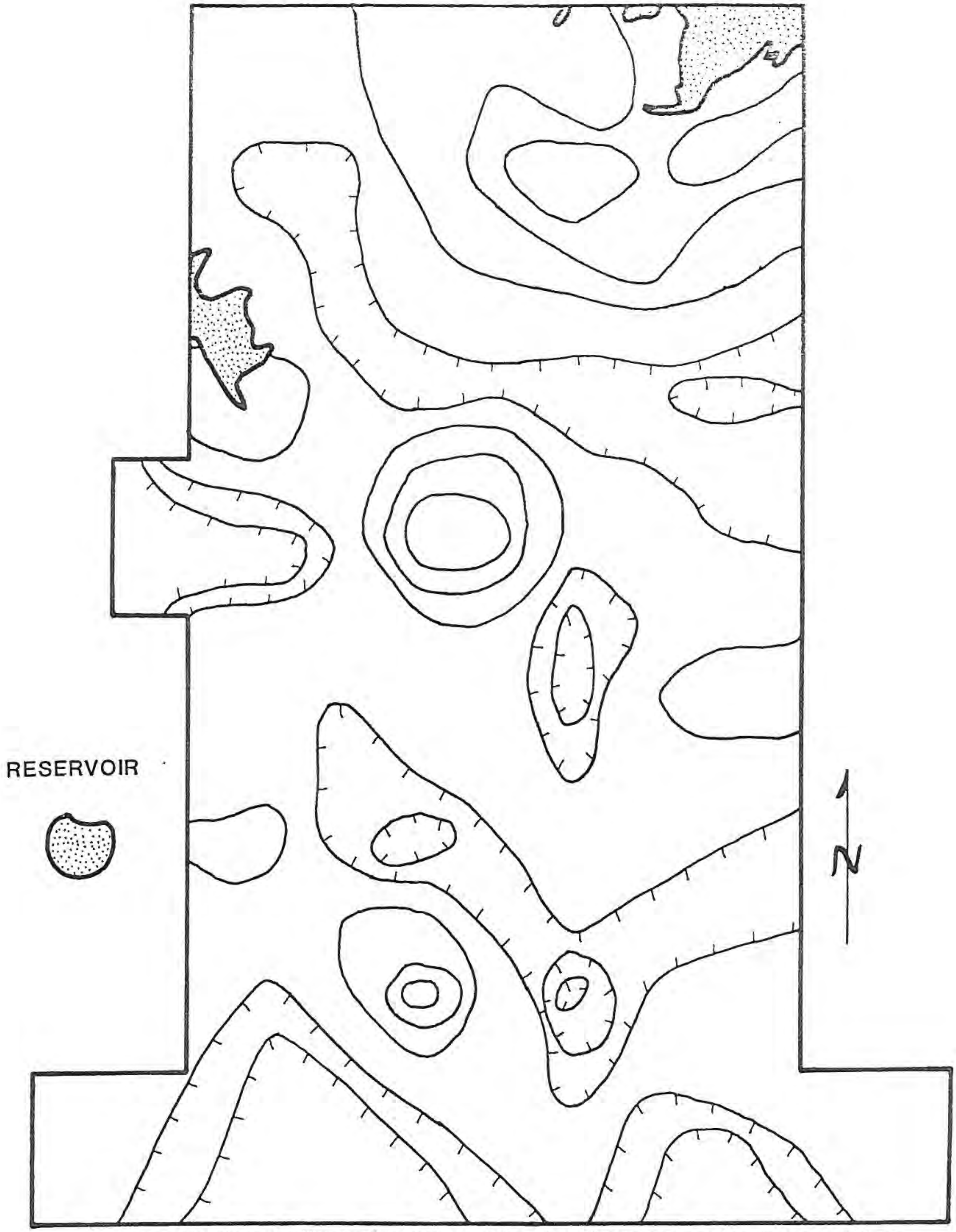
Figure 3: Map of Site Frequency Per Grid Unit with Control Point Values





Successive lines indicate increased site density: successive hatched lines indicate decreased site density.

Figure 4: Trend Surface Map of Site Density



Successive lines indicate increased site density: successive hatched lines indicate decreased site density.

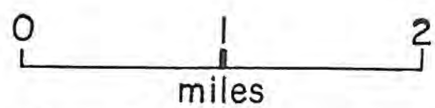
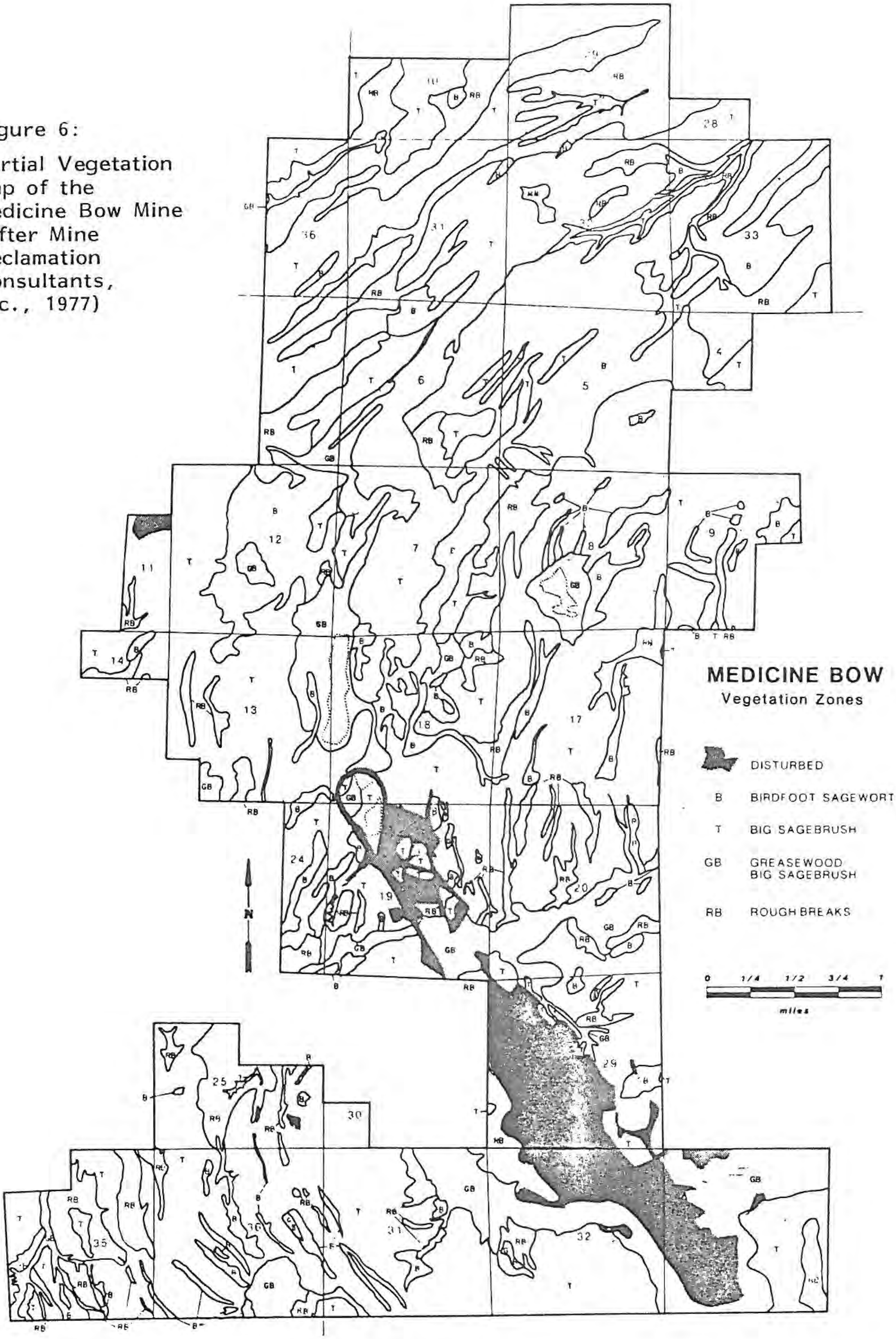


Figure 5: Trend Surface Map of Site Density Employing Site Ranking

Figure 6: Partial Vegetation Map of the Medicine Bow Mine (after Mine Reclamation Consultants, Inc., 1977)



ARCHAEOLOGY IN THE CARBON BASIN

by

Jana Vosika Pastor and Rhoda Owen Lewis
Metcalf-Zier Archaeologists, Inc.

During the summer of 1980, an archaeological inventory and some limited testing was conducted for Energy Development Company on nine and one-half sections of land within the Carbon Basin. The Carbon Basin is located in Carbon County, Wyoming, approximately six miles northeast of the town of Elk Mountain. The Basin is bordered on the west by the Saddleback Hills and to the south by the Medicine Bow Mountains. The project area is cut by three intermittent streams. Second and Third Sand creeks drain east/northeast to the Medicine Bow River, which in turn flows to the Seminoe Dam. First Sand Creek meanders northeast to Allen Lake. Many small springs, dams and small ephemeral drainages dot the landscape.

Carbon Basin supports a diverse vegetative community. Riparian zones exist along the Medicine Bow River and there are small juniper breaks along some of the ridges. However, the majority of the Basin is a sagebrush-grassland zone.

The average elevation of the project area is 7200 feet with approximately 400 feet of local relief. Sandstone outcrops are common and vary from massive, continuous outcrops to small isolated ones. Wind and water erosion has sculptured some of the outcrops providing suitable habitats and protection from the elements. The area also contains large flat ridge tops, gently rolling hills, and lush river bottoms. The Carbon Basin provides easy access to the foothills and mountain regions of the Medicine Bows and to the Hanna and Shirley Basins.

During the initial literature search for this project, it was found that little previous archaeological work had been done in the Carbon Basin. However, several sites, which have been reported in or near the Basin, are of archaeological significance and are eligible for nomination to the National Register of Historic Places. The Garrett Allen/Elk Mountain site is located approximately eight miles southwest of the project area. It is a stratified site containing Woodland type pottery, lithics and butchered bone.

The Nidiwh site is within the confines of the Carbon Basin and is a multi-component site containing stone circles, rock shelters, Intermontaine Ware pottery, ltihics and burned bone (predominantly elk). Small surveys have been conducted in the Carbon Basin by Western Wyoming College, the Bureau of Land Management, and the Wyoming Recreation Commission.

A total of 35 prehistoric and historic sites were located and/or relocated in the nine and one-half section area. Seventeen of these sites were determined to require evaluative testing. Only four of these sites were tested during the 1980 field season. A wide variety of sites were found: lithic scatters, open camps, stone circles, rock shelters, a bone bed, historic mines, and a homestead.

Three mines and a homestead were recorded and mapped. One of these, the Kent Mine community, was active during the early part of this century. Paul Sierson, an historian from Elk Mountain, evaluated the sites and determined that they did not contribute significantly to the history of the Carbon Basin and no further work was required.

Two stone circle sites were located during this project. 48CR1482 contains 76 stone circles ranging in diameter from 2.9 meters to 5.3 meters with a mean diameter of 4.11 meters. The site is located on a windy ridge with an excellent view in all directions including a vantage of the drainage along Second Sand Creek. As with many stone circle sites found on the Plains, these contained no surface evidence of internal or external fire hearths. A total of five artifacts were located on the site. Site 48CR1498 had 13 stone circles. The circles at this site were larger than those at 48CR1482, with a mean diameter of 4.52 meters. One of the features contained fire cracked rock and another had a central rock arrangement. This site is also located on a ridge overlooking a drainage. Seven artifacts were collected on 48CR1482.

Although a very minor portion of the Basin has been inventoried, four stone circle sites have been recorded there. Eighty-two stone circle sites have been located witin a 20 mile radius of the center of the Carbon Basin. This figure constitutes one-tenth of the total number of recorded stone circle sites in the entire state.

The north one-third of a section along Third Sand Creek contained five sites and twelve isolated finds. This locale is conducive to prehistoric occupation because it provides accessibility to water, game and diverse vegetation. Even in August, the creek held small pockets of water. The adjacent hillside has isolated sandstone outcrops which provide shelter and a variety of plant species not found in the drainage. Lithic material in this portion of the section was abundant and scattered. Middle Plains Archaic type projectile points (ca. 4500-3000 B.P.) and Late Prehistoric type projectile points (1500-200 B.P.) (Frison 1978) were collected.

The area has undergone extensive deposition, and cultural material was only obvious in eroded areas. Specific sites were established for recording purposes by delineation of material concentrations. An extensive arroyo inspection revealed cultural material (ground stone, flakes, and bifaces) buried under one to two meters of alluvial fill. Only a surface survey has been completed in this section, however, one hearth which was in danger of destruction by erosion was excavated. The hearth was located 1.1 meters below the present ground surface in the wall of an ephemeral drainage of Third Sand Creek. The feature was a slab-lined pit containing charcoal and burned sandstone. No ground stone, chipped stone, lithic debitage, or burned bone were noted in or around the hearth. The flotation analysis revealed no charred seeds, but did identify the charcoal fragments as sagebrush. A charcoal sample was submitted for C14 analysis and the date returned for the hearth is 4690±70 B.P. (Beta 2429). To fully evaluate this area, it will be necessary to do extensive backhoe testing. The number of sites and isolated finds coupled with apparent depositional sequences suggest long term and/or repeated occupation of this entire area.

Four rockshelter sites were found during the surface reconnaisance. Although from surface evidence they don't appear to be as expansive as the Nidiwh site, they did contain burned bone, lithics and fired sandstone.

With the exception of the Early Plains Archaic Period, ca. 8000-4500 B.P. (Frison 1978), projectile point typology indicates occupation of the Carbon Basin for the last eight to nine thousand years. The midsection of an Eden point and a resharpened Scottsbluff point, ca. 9000-8400 B.P. (Frison 1978), were located on the project. A fragment of a concave base projectile point was also found. The form of the basal fragment is reminiscent of the paleo-Indian period.

McKean variants, which occur in the Middle Plains Archaic, were the second most numerous point types recovered. One of these was an isolated find; the others were found in association with other cultural materials. Two projectile points typed as Late Plains Archaic were identified. One of these was from a multicomponent site containing paleo-Indian and Late Prehistoric period points. Over half of the identified projectile points from the project were Late Prehistoric. The Late Prehistoric points collected on this project were side or corner-notched and the bases ranged from concave to straight to convex.

One large dark brown chert projectile point was collected on the same site as the possible paleo-Indian period projectile point base. The point is side-notched with a convex base, very sharp tip, and extensive basal thinning. The point, if it is a point, fails to fall neatly into any typological categories. The other anomolous artifact to come off the project is a large red chert corner-notched tool. Along one side of the cutting edge, the tool has been steeply retouched. It has deep corner notches, a straight base, and extensive basal thinning. The tool appears to have been resharpened. Two Late Prehistoric projectile points were found on the same site as the hafted cutting tool.

Very little archeological work has been conducted in the Carbon Basin so it is difficult to draw many conclusions about subsistence-settlement activities of the area. Only nine and one-half sections were inventoried and a very minimal testing program was instituted during 1980. The sites that were deemed most significant during inventory have not, as yet, been fully evaluated.

The location of the Carbon Basin is advantageous to transhumance from the plains into the foothills and mountain regions. The diverse tool assemblages found suggest that various activities were carried out in the Basin. Thirty percent of the sites contained ground stone and the Nidiwh site has butchered elk bone and ceramics. Projectile points collected suggest prehistoric use of the area from over 8000 years with a possible gap in occupation during the Early Plains Archaic period or the Altithermal. As with many areas of Wyoming, more data are needed to understand the area.

REFERENCES

Frison, George C.
1978 Prehistoric hunters of the High Plains. Academic Press, New York.