Continuity and Change in the Washakie Basin, Wyoming: Interpreting Mobility from the Archaeological Record

by

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GEROLD FRANKLIN GLOVER Continuity and Change in the Washakie Basin, Wyoming: Interpreting Mobility from the Archaeological Record (Under the direction of Carole Crumley and Vincas P. Steponaitis)

ABSTRACT

Among archaeologists faced with the myriad lithic scatters recorded in the North American West there has long been a desire to incorporate these small, indistinguishable sites into settlement pattern studies. Using organization of technology studies of these sites allows a new approach in developing a greater understanding of prehistoric lifeways as reflected in the settlement patterns and tool assemblages left behind by former occupants. Contrary to earlier research that often relied on establishing chronologies and far flung cultural areas based on single or small groups of excavated sites, a more regional approach is suggested here. The goal of this study was twofold: first, to determine if analyzing data derived from collated Cultural Resource Management studies can produce insight to culture change through time within the context of prehistoric regional settlement patterns; and second, to establish the efficacy of a "coarse-grained" approach to comparing lithic tool assemblages in order to elucidate the diachronic utilization of a region as reflected by environmental and cultural change.

The ability to incorporate the largely heretofore ignored small lithic scatters into organization of technology studies represents a new effort to understand the prehistoric inhabitants of the intermountain basins of

Wyoming, and their changing mobility and settlement patterns. The necessity of establishing methods for comparing, contrasting, and collating cultural resource data is also addressed.

The analyses presented challenges the commonly held view that surface lithic scatters can offer little substantive insight into prehistoric lifeways. I demonstrate that useful information can be derived from the dry bones of Cultural Resource Management reports. The ebb and flow of specific resources and tool types suggest degrees of mobility and territoriality previously unrecognized in south-central Wyoming. In particular, questions of the sudden increase in population at the close of the Late Archaic and the beginning of the Late Prehistoric are addressed in terms of more intensive utilization of the richer resources available as a result of an improving environment.

Acknowledgments

The memory of sitting near the muddy shore of a Wyoming playa nearly two decades ago still lingers as a joyous event in my mind. Recording first dozens, then hundreds of lithic scatters among the dunes and windswept ridges left me with a desire to understand what drew the prehistoric inhabitants to this rather inhospitable region. My particular interest in the stone tools left by those people provided the first inkling that very notable changes occurred through time in this region. Discussion with co-workers during that summer furthered my fascination in High Plains prehistory. To Dave Vlcek and Jamie Schoen I owe a special debt. Our discussions, sometimes noisy, aided me in questioning assumptions about the region and the impact that Cultural Resource Management studies were having on the discipline of archaeology. The following year when I returned to Wyoming Peter Miller provided data and encouragement that I was not to appreciate fully for some time to come. Although years were to pass before I resumed my research into the Wyoming data it was this friendship with these men and other members of the Wyoming survey crews that established my lifelong interest in lithic studies and the role such endeavors could play in elucidating the past.

I wish to take this opportunity acknowledge the guidance and support of the members of my doctoral committee: Carole Crumley, Joel Gunn, Clarke Larson, Vin Steponaitis, and Bruce Winterhalder. Due to their efforts I was able to rejoin archaeology in a meaningful way. Initially, it was the broad smiling face of Vin Steponaitis who encouraged me to return to analyzing the hundreds of site forms that were to comprise this study. In particular, his suggestion that I invite Clarke Larson onto my doctoral committee and later his substantive comments on an earlier draft of this dissertation served me well. Clarke Larson deserves special thanks for the numerous conversations via E-mail that heralded a new medium for thoughtful exchange of constructive criticism and ideas. His advice and cogent comments were a profound influence on the direction of my research. Joel Gunn directed me toward new ideas in environmental and geomorphology studies in North America, while, at the same time, insuring that I stayed focused. Bruce Winterhalder gave me my first glimmerings of the ecological basis for human subsistence and settlement patterns. Finally, I want to acknowledge Carole Crumley, my doctoral advisor. Her singular perseverance, more than anything, helped me overcome mental obstacles that loomed many times. For her good humor, sound advice, ready willingness to listen to an unsure voice on the phone (and ultimately, her dire threats if I did not finish), I owe more than can ever be expressed.

Separately, I wish to acknowledge the editorial assistance of numerous people who read and commented on various drafts of this dissertation. Tom Padgett, my friend and my boss for the past 4 years, never hesitated in his help. Clayton Smith, whose friendship has always heartened me, saved me more than once with inestimable help by scanning figures and from crashing computers. Steve Davis provided advice about assembling the data into a coherent whole and formatting the manuscript. I could not have done it without them. They all deserve the highest approbation. Of course, the conclusions reached (and any flaws therein) are my responsibility and mine alone.

Returning to academic pursuits after a prolonged sojourn is especially trying, not only for the one making the attempt, but for those around him. In my case, I have been especially fortunate. From the early days of my return to this pursuit I am profoundly grateful for the love and encouragement I received from Julia Crane, Professor Emeritus of the Department of Anthropology, University of North Carolina. She aided me with my first hesitant steps in returning to a discipline I love. My co-workers with the North Carolina Department of Transportation all deserve my sincerest appreciation. As in every life, I owe much to those who touched me in the past and whose influence continues to play an important role in my life. Most especially I want to thank Art Rohn, my mentor long ago in Kansas, who taught me to question the data and how to hold a trowel.

Lastly, I want to thank those dearest to me: to my mother those encouragement and love has always sustained me, especially her forcing me to read aloud at age six to begin my lifelong love of knowledge, to my father who was simply proud, and most important, to my wife, Nancy, whose support, laughter, and love lifted me from despair. She, ultimately, made all this a reality.

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Chapter I

Introduction

The purpose of this dissertation is to address the practicality of using organization of technology studies to investigate broad cultural changes through large scale regional surveys. An argument is made for the efficacy of incorporating large scale intensive surface survey data derived from cultural resource management studies to address questions regarding territory, mobility, and population change as reflected in documented lithic assemblages. A portion of south-central Wyoming provided intensive regional surveys of wide overlapping areas as well as surveys that include strategraphic excavations (Figures 1.1, 1.2).

Earlier lithic studies have concentrated on one or a few sites with a narrow focus of reconstructing reduction trajectories and/or tool function. The past decade has witnessed an emergence of archaeologists who wish to move beyond the single site or cluster of highly visible sites (Wobst 1983). Kelly warns that

> Technological organization studies must 'draw back' from the single site, however, and encompass a larger region, for I suspect that it is at the regional scale that patterning relevant to organizational studies will become apparent. This is not to say that detailed site studies are irrelevant, but only that technological organization specially refers to the relationship between activities, raw material, and tool manufacture, use, and discard (1994:133).

It was during a preliminary examination of the Wyoming data that, intuitively, a trend was suspected which delineated a significant difference between the Late Archaic and Late Prehistoric occupations as evidenced by lithic procurement, lithic preference, and settlement pattern. By necessity the available data requires a picture of the region to be painted in broad strokes. The focus will be on general trends, relative changes through time, and not quantitative measurements of absolute precision. Settlement/subsistence questions cannot be examined with the intensity the author would wish, but hopefully, this dissertation provides a basis for formulating questions to be addressed in subsequent investigations. Identification of lithic material types, source location, and temporal evidence could all be of greater precision, but, on the other hand, this regional study, utilizing the results of numerous CRM reports, requires analyzing the region by the lowest common denominator which still reveals patterned change through time. To borrow a term from the field of ecology, this endeavor is a 'coarse grained' examination of prehistoric settlement systems.

The investigation discussed herein incorporates survey reports covering 71 mostly contiguous square miles (184.5 square kilometers), two intensive right of way surveys, and finally the intensive collecting and testing results of two pipeline construction projects crossing the same region of south-central Wyoming. Most surveys conducted in the Wyoming Basin have been arbitrarily selected by the energy development corporations in their quest for natural gas and oil. While not randomly drawn, the objective was to bring together the diverse assortment of archaeological reports dealing with the same survey area. Few such empirically based syntheses from a regional perspective of reports from south-central Wyoming have been forthcoming.

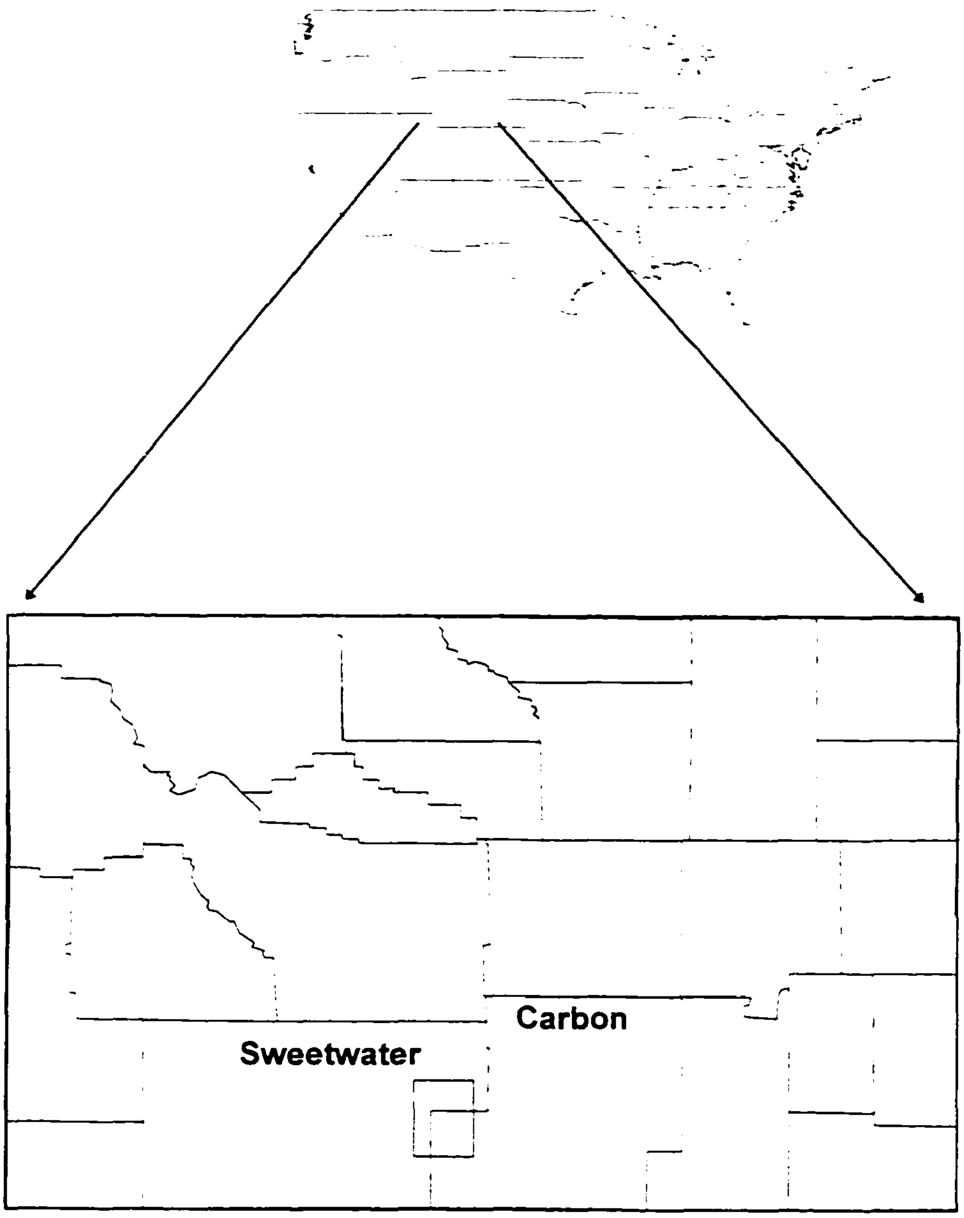
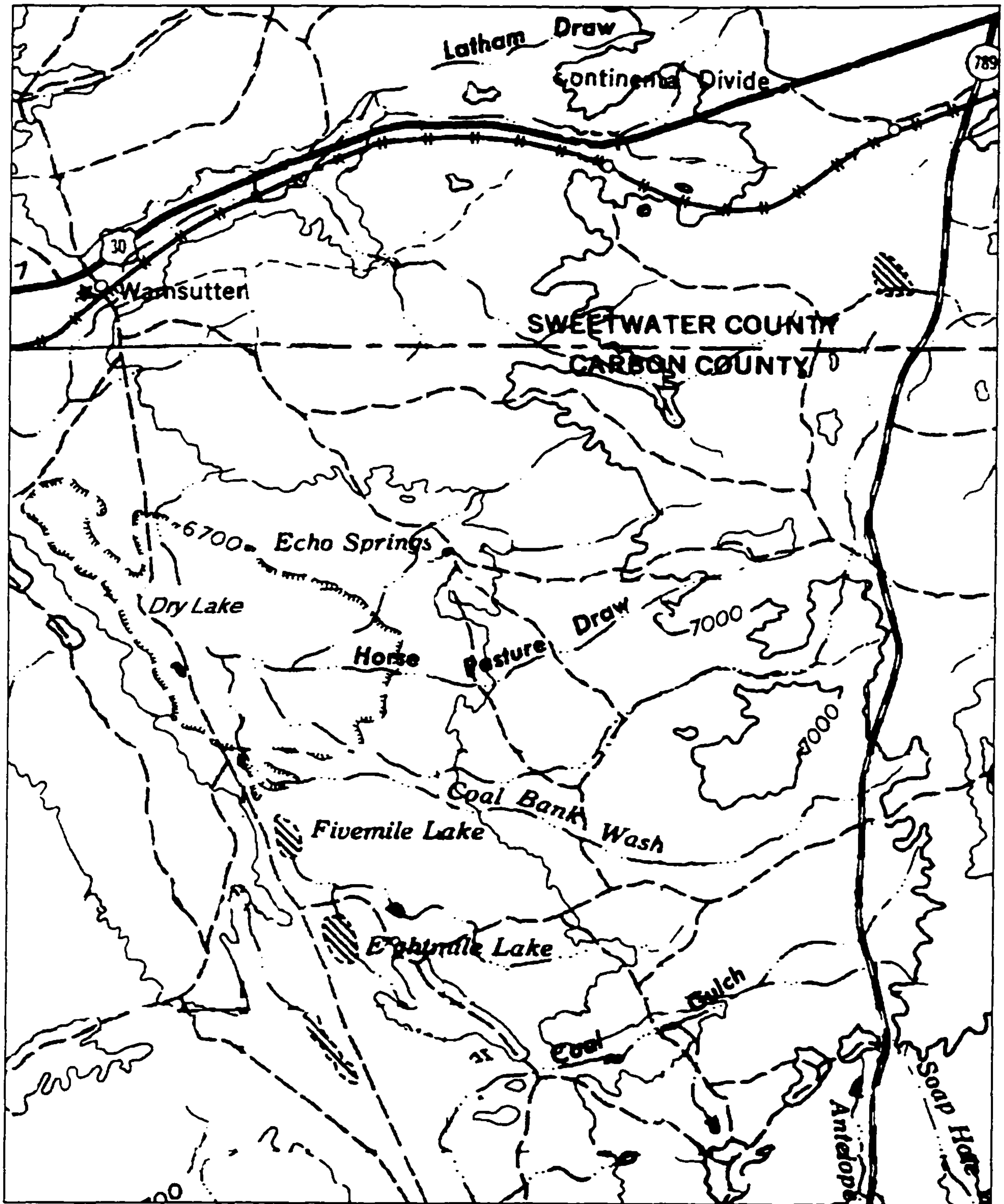


Figure 1.1. Wamsutter Region, Wyoming
Survey area delineated by box



Scale 1:250000
200 ft Contours

Figure 1. 2. Wamsutter Project Area

Bear in mind these projects overlap the same area during a three year period with little or no regard to previous work other than to acknowledge sites originally discovered during previous surveys. The main thrust is to collate these diverse resources, examine the data in order to elucidate settlement patterns in terms of the organization of technology with the context of the cultural chronology as suggested by Frison (1991).

Drawing inferences for settlement patterns based upon the lithic technologies and technological organization has recently received a great deal of attention. The effects of raw material availability, functional preference, and variability have been studied diligently (Binford 1979, Gramly 1980, Bamforth 1986, Yerkes 1989, Andrefsky 1991). Most of these studies have concentrated on the hunter/gatherer subsistence patterns in an effort to better understand settlement systems. For those mentioned above, all except Gramly (1980) have measured lithic material in terms of its scarcity. Gramly addresses the organization of technology through examination of discarded tools at a quarry site in Maine where raw material abounds.

For these reasons this dissertation addresses three primary concerns; including 1) the efficacy of small scale CRM reports to develop regional analyses and the concomitant shortcomings of such, 2) an overview of the settlement patterns of south-central Wyoming, and 3) analysis and interpretation of cultural change between Late Archaic and Late Prehistoric occupations as reflected in differences in lithic materials, procurement, manufacture, and discard. Variability in the technological organization between sites of these latter stages of the cultural chronology appear to be significant, reflecting a major change in the economic utilization of the intermontane basins in southwestern Wyoming.

Wyoming, like many western states, experienced a tremendous upsurge in energy development during the oil crises of the early 1970s. Coal, oil, and natural gas are all found in abundance in the Rocky Mountain region identified as the Overthrust Belt which stretches from Colorado, through Wyoming, and into Montana. Simultaneously, the Surface Mining Act of 1966, part of the legislation to be known under the rubric of CRM, was enacted. Following an initial period of confusion and interdepartmental wrangling between federal and state agencies there came an explosion in the number of archaeological survey reports. In some cases, such reports were produced prior to the establishment of criteria delineating the basic parameters of regional archaeology between various governmental agencies. Because the oil and natural gas leases were placed in a checkerboard fashion across the landscape the requirements to determine the significance of recovered prehistoric and historic remains consisted essentially of inventory and avoidance. Literally thousands of well pad and access road surveys flooded into local Bureau of Land Management (BLM) offices and the State Historic Preservation Office (SHPO).

A decade later, little had changed in the methods of locating sites and determining the significance of the archaeological record when Frison (1984) called for an end to the 'business as usual' of inventory and avoidance without a parallel program of research. Particularly important was the realization that following the recommendations of avoidance for a visible surface site by rerouting a road or pipeline simply subjected the undiscovered subsurface site to destruction by heavy equipment. Even monitoring such activities recovers little of scientific value since the cultural locus (site) is not recognized until the earth-moving equipment, such as a bulldozer or trenching machine, has exposed the site by destroying the very evidence the archaeologist sought to protect. Unfortunately, it seems that in the years since Frison's plea little heed has been given to these suggestions regarding CRM research.

It is not the concern of the present study to present a condemnation of CRM work, but rather to point out some of the drawbacks of using CRM reports and to understand the biases which can occur in subsequent analysis. As will be discussed in Chapter II, intrasite sampling of regional archaeological population is a significant concern. Of lesser importance, at least in this study, is the lack of a random intersite sampling strategy. Essentially, a compilation of contiguous reports produced through a full-coverage survey format lessens the need for such a strategy. Utilizing data obtained for purposes other than those presented here brings the recognition of possible sampling error through systematic biases. As is often the case in CRM research it is hoped that a more intensive examination of a region can serve as a statistically drawn sample. Though recognized in many regions, the notion is borrowed in a simplified way from statistical theory where the larger the sample size the better the estimate of variance. Furthermore, it was hoped that where a large number of sites was encountered in such a homogenous environment, basic location patterns would begin to emerge (Goodyear *et al.* 1979:36). The present study was conducted with similar assumptions in mind. It is hoped that the collation of many survey reports will provide a sufficiently large data base to derive meaningful results, if only to clarify questions for further research.

Chapter III presents, albeit on a small scale, an overview of the prehistoric utilization of the intermontane basins of south-central Wyoming. For the most part this portion of Wyoming has received little attention in the archaeological literature even though the Wyoming Basin comprises nearly a quarter of the state. Much of the significant archaeological research in Wyoming has been on restricted topics that did not address issues such as settlement patterns or regional concerns. One archaeologist referred to previous investigations as the "myopia of single sites" and expressed a desire to move beyond such research (Wright 1987:209). The lack of spectacular stratified sites, or major killsites, have, until recently, kept the eyes of the archaeological community turned elsewhere. When Frison (1978) first published a comprehensive overview of Wyoming archaeology he made few references to the Wyoming Basin. More than a decade and hundreds of contract reports later, Frison (1991) mentions only one additional site from the Wyoming Basin, the Deadman Wash site, a deeply stratified site (Armitage *et al.* 1982). Since the 1970s the rapid increase in Cultural Resource Management projects in the region has led to an upsurge of archaeological survey and testing programs. Unfortunately, the reports of various private contracting companies and academic institutions detailing the results of such endeavors is all too often reburied in government archives. The primary reason for this entombment has been the issuance of small numbers of these reports. Individually such reports can contribute little beyond speculation in understanding a region's prehistory but drawn together perhaps they can bring into focus a clearer picture.

Surveying a proposed well pad site, usually 40 acres, and attendant access road offers little of scientific value beyond an occasional diagnostic artifact. The process is costly and inefficient in terms of planning for energy development of large tracts of land containing coal, oil and natural gas reserves; although these reports are available, they are difficult to obtain. In only a few instances have these reports been compared and the data used to test hypothesis regarding prehistoric utilization of the intermontane basins. For example, Fawcett and Latady (1983), assembling data from hundreds of well-pad surveys from southwestern Wyoming, compared Wyoming settlement patterns against Thomas's (1973,1975) analysis of Late Prehistoric Great Basin settlement data from Nevada. They effectively demonstrated the lack of explanatory power of Thomas's model in the High Plains of Wyoming. More recently, Smith (1988) collated data from a number of cultural resource management projects to examine changes in plant resource utilization through time.

Based on an apparent decrease of distance traveled to obtain lithic resources in the Bighorn River Basin at the close of the Archaic Period, Eckles(1985) argues that population increases restricted territory. A comparison between data from the Wamsutter study area and the model suggested by Eckles from the Bighorn Basin of northeastern Wyoming demonstrates possible shifts in settlement patterns different than those derived from the latter data. Using concepts first proposed by Binford (1977, 1979, 1980), Eckles examined lithic material, discard rates, and lithic reduction strategies in an effort to determine the extent of territories for the region. For the Wamsutter region the evidence discussed in Chapter VI suggests that the opposite appears to have occurred at the close of the Archaic.

Aspects of Binford's (1977, 1979, 1984) ethnoarchaeological investigations among the Nunamiut Eskimo and the Alayara aborigines of Australia have contributed to the formulation of models of prehistoric site formation across the spectrum of North American archaeology (e.g., Kelly

1983, 1985, Odell 1994, Sassaman 1994). For Eckles' (1985) study the greatest concern was with how Binford distinguishes between different site types produced within the range of subsistence strategies he posited among hunter-gatherers. Binford (1980) is credited with establishing a dichotomy between two types of adaptive strategies: foragers and collectors. At the most simplistic level, foragers acquire food on a daily basis (consumer to food) while collectors carry out a subsistence strategy which incorporates greater logistical planning and storage of resources (Binford 1980:10). Although this dichotomy is frequently found in the archaeological literature as two distinct entities others feel that Binford intended the terms to define ends of a continuum (Kelly 1995:120).

Sites seem to become more specialized as the variety of tools decreases on Late Prehistoric sites and the frequency of more distant, lithic material increases. This increase is corroborated by a significant decrease in primary lithic reduction sites for the local lithic sources. Significant differences regarding culture change between the findings for that region and south-central Wyoming were discerned, based on comparison of lithic assemblages. Advances in method and theory over the past decade allows an examination of the Wyoming data in light of new developments. If we accept Binford's ideas (1980) as modeled by Eckles (1985) regarding population growth and culture change, then something clearly different was occurring in south-central Wyoming.

The extent to which Archaic subsistence and settlement patterns within the Great Basin regions of eastern Utah, southwestern Idaho, and the northern Colorado Plateau can be equated with western Wyoming remains an intriguing question. This is particularly true of the Fremont Culture and later

Shoshonean evidence. The Wyoming Basin of southwestern Wyoming cannot be assumed to be a static climatic or cultural region even though evidence suggests that the hunter/gatherer lifeway was maintained from the close of the Pleistocene until historic contact with few measurable outside influences. The dichotomy between the Paleoindian and Archaic periods immediately comes to mind. There is mounting evidence that significant shifts in settlement and subsistence patterns occurred at the end of the Archaic, especially as reflected in settlement location factors, size of territory, and length of occupation of sites (Eckles 1985, Frison 1991). However, shifts in response to environmental changes, information exchange, population movement, or invention may be to subtle to detect through archaeology.

Developments in organization of technology studies, as outlined above, can address questions concerning mobility, material acquisition, population growth and movement, and site formation processes. For example, the present work examines proposals put forward as explanations for the apparent sudden increase in population at the beginning of the Late Prehistoric Period in south-central Wyoming. The concluding chapter offers questions regarding future investigations suggested by the investigation presented here.

Chapter II

Method and Theory

From a cultural perspective, the prehistory of the High Plains of Wyoming can essentially be characterized as an uninterrupted hunter/gatherer way of life. Evidence, manifested primarily by lithic tools and debris scattered over the landscape, remains as static shadows to humankind's interrelationship with their environment. While disagreements occur concerning the intensity of occupation through time, particularly in regard to the Altithermal, culturally known as the Early Archaic (Frison 1978), the idea suggested by Reeves (1973) that the High Plains were abandoned during this period of drier, more severe environmental conditions is no longer accepted.

Wyoming's archaeological prehistory is characterized almost entirely by stone tools recovered through surface collection and/or excavation. Determining the location, content, and origin of these finds provides an initial step in understanding the settlement patterns of the prehistoric occupants of the region. Cultural ecology, understanding the interplay between humans and their environment, provides a theoretical tool through which the static evidence can give insight into the dynamics of prehistoric cultures. The early days of applying ecological theory to the archaeological record promised much more than it, eventually, could deliver. There were those who wholeheartedly embraced the study of human ecology, but asked far more of it than it could possibly provide. Jochim (1976), in requiring caloric intake of a prehistoric population as part of his model of hunters/gatherers, is a noteworthy example.

Thomas (1986) and Bettinger (1991) have presented comprehensive overviews of hunter/gatherer studies in North America while Kelly has compiled a worldwide data base to address questions "in terms other than broad typological categories such as generalized versus specialized, simple versus complex, storing versus nonstoring, or immediate versus delayed turn" (1995:343). Harpending and Davis (1977) presented an early model for understanding the archaeological record of hunters/gatherers, especially in terms of spatial distribution of resources and their exploitation. Butzer (1982) also contributed significantly to the theoretical understanding of human ecology. Especially important for our purpose was discussion of the patterns and relationships which can be applied to resource concentrations and mobility in regards to hunters and gatherers (1982:241). These ideas were intended to provide a generalized understanding of how the archaeological record can be perceived in terms of settlement/subsistence and how these aspects of prehistory change through time. Attempting to understand a region's prehistory is limited in the present study to the analysis of lithic material in terms of procurement, distribution, and organization of technology.

One aspect of applying human ecology theory to the archaeological record is the field of ethnoarchaeology. Such an approach is akin to the Direct Historical Approach given its greatest impetus by W. D. Strong (1935) in his discussion of Nebraska archaeology. Historical materialism can still be effectively employed to infer aspects of prehistoric economies and social strategies (cf. Sassaman 1994). Analysis of living cultures to provide models of adaptive behavior that allows a perspective on the prehistoric past has gained a tremendous following in the past two decades. Gould (1980), for example, has been concerned with broad-scale processes of behavior, not only within a particular habitation site, but in the context of interaction between and within groups. From an ecosystemic approach, Gould has attempted to delineate those types of behavior dealing with adaptive mechanisms that act to minimize the ecological constraints placed on a society.

At the other end of the scale, regarding applicability to archaeological research, the early work of Lewis Binford (1979,1980,1983) stands out. His work is concerned with site formation processes and has provided the basis for current understanding on how technology was organized in the past (Torrence 1994:125). Though not the first to do so, Binford's use of ethnoarchaeology of the Nunamiut to establish a methodology for translating the archaeological record into testable hypotheses has proven useful.

Briefly, Binford established sharp contrasts in order to distinguish between two ends of a spectrum of hunter-gatherer adaptive strategies: foragers and collectors. Foragers collect and consume their resources in a structure of immediacy. In contrast

> collectors are characterized by (1) the storage of food for at least part of the year and (2) logistically organized food procurement parties. The latter situation has direct "site" implications ... special task groups may leave a residential location and establish a field camp or a station from which food-procurement operations may be planned and executed (Binford 1980:10).

Such differences in adaptive strategies produce visible evidence in the form of different types of archaeological sites. Foragers produce two types of sites: residential bases and locations where extractive activities are conducted. Collectors, on the other hand, produce these site types as well as three others: field camps, temporary centers for task specific groups; stations, where information is acquired; and caches where specific resources are stored for latter consumption. Peoples employing a foraging strategy move their residence more frequently, thus creating fewer limited activity sites. Such archaeological sites will be more homogeneous in content (Kelly 1995).

However, warnings are growing about the dangers of forcing recovered technological variation into either a collector or forager mode of subsistence (Torrence 1994). These 'types' proposed by Binford carry the potential to allow data to be pigeon holed into rigid typological classifications. We must endeavor to regard tools in the dynamic context of acquisition, use, and discard rather than static typological classes (Bradley 1991:369).

Building on the early work of Binford, Kelly (1983, 1985, 1988, 1994, 1995) has concentrated on understanding the cultural and environmental constraints of ethnographic and ethnohistoric hunter-gatherers. He began by initiating development of theories of hunter-gatherer mobility strategies with his early research concentrated on the quantification of mobility data. Variables such as 1) number of moves per year, 2) average distance per move, 3) total area covered per year, and so forth., were formulated to gain insight into seasonal mobility throughout in the Great Basin region of Utah and the Colorado Plateau (1983:278). Compiling data of hunter-gatherer cultures from around the world, Kelly (1985) used this data to address questions of Great Basin mobility strategies and why groups chose sedentism over mobility. The role of the environment played a crucial role in these investigations. Kelly recognized that exploitation of natural resources, whether plentiful or scarce , is dependent on an environment predictable enough to allow scheduling for the utilization of resources.

How resources are spread across the landscape and exploited in a cost effective manner led to Kelly's adoption of an ecological framework for further investigations. His doctoral research in the Nevada Great Basin questioning factors leading to sedentism during the Fremont period concluded that " sedentism is not the logical result of the exploitation of *abundant resources, but is instead a form of settlement humans were forced into using because of decreased resources*" (Kelly 1985:312 emphasis his).

Finally, Kelly (1995) produced a compendium of data relating hunter-gatherer peoples from a vast amount of ethnographic and ethnohistoric literature. His evaluation of critical theoretical models of behavior offers archaeologists a new tool in analyzing the disparate fragments of archaeological evidence. Perhaps Kelly's most important contribution to the study of prehistoric hunter-gatherers has been the succinct exposition of the fallacy of using modern-day hunter-gatherer cultures as analogues for prehistoric behavior. Ultimately, he points out the dangers of applying modern hunter-gatherer evidence to prehistory. Instead, he suggests that the goal should be determining the "factors conditioning human behavior and culture - for example, constraints of foraging, factors effecting trade and territoriality and the ecology of reproduction (1995:35). His recognition that, although human behavior occurs within an ecological framework , decisions are also made within historical and cultural constraints.

For our purposes we are constrained to interpret South-central Wyoming prehistory by its lithic evidence. This is more a function of the methods of data acquisition and recording (i.e., survey) than of availability. The problems regarding intrasite diversity, that is, sample diversity as a direct function of sample size, has been ably demonstrated. While aware of the dangers of sample bias, it is still true that

> assemblage diversity is not, of course, unrelated to site function, but the exact nature of that relationship can be appreciated only by focusing on the relative (rather than absolute) degree of diversity (Thomas 1989:86).

Humans interact with their environments in a non-random manner. This dynamic interaction with the environment leaves culturally static evidence: abandoned hunting stands, butchering stations, campsites, storage pits, discarded or cached tools. Archaeological evidence ranges from opportunistic events to the most carefully planned and scheduled activities. Along this continuum of ecological interaction the greater the evidence of variability in activities, the greater the likelihood that loci (sites) were selected based on a wider range of variables. This variability is indicated by diversity of tools, features and materials. The opportunistic killing and butchering of a single animal leaves a far different archaeological record than the coordinated efforts of a band of hunters driving a herd of animals into a corralled entrapment where they are slain, systematically butchered, preserved, and stored for later consumption. Yet both are but different aspects of the same hunting behavior.

Any attempt to determine site function based on the evidence provided by surface recovery alone can be held in dispute because of the correlation between sample size and diversity. Jones (*et al.* 1983) clearly demonstrated the dangers of relying on surface sampling to determine artifact richness, based on a surface survey of a portion of Oregon and the subsequent test excavations involving a number of the same sites. Their analysis demonstrated a positive correlation between the two; increased sample size leads to increased diversity of artifacts. Thomas (1986) reiterated their findings by asserting the fallacy of using surface assemblages to determine site function. The problem of dealing with surface lithic scatters has proven to be a stumbling block for many in the arid West when attempting to fit them within an overall settlement system. However, these arguments are made in the context of single cases, not large scale surveys where tens or hundreds of sites are tabulated.

Various methods have been offered in an effort to clarify site function (Kvamme 1988, Kintigh 1984, 1989). Kintigh offers a useful method of measuring site diversity, based on the premise that the longer the period a site was occupied, the more different kinds of activities have taken place. Kintigh (1989) demonstrates from a practical application Thomas's (1986) theoretical caution that diversity needs to be examined in 'relative' terms and not absolute measurements. "Diversity provides a broad-range filter for data that helps point out the more interesting cases for further examination" (Kintigh 1989:36). The greater numbers of cases, like the diversity eluded to by Kintigh also acts as a filter which exposes the coarse trends in assemblages investigated.

Regional Studies

Though regional investigations did not originate with cultural resource management research, there has been a florescence of such investigations in the nearly three decades since the establishment of the National Register of Historic Places as well as accompanying federal legislation. Early recognition that the nation's prehistoric resources are bounded and finite acted as the impetus to secure federal protection for them, and the archaeological community strove diligently for passage of such legislation. At some level, arguments for and against the inventorying of our resource base still continue, but cultural resource management coupled with the "New Archaeology" of a generation ago has been a major source of inspiration in rethinking the theoretical and methodological basis of our discipline.

A portion of this rethinking archaeology deals with survey methodology and sampling. Failing to develop a universal scheme for recording and cataloging surveys so that data are comparable to future studies beyond the immediate research goals continues to be a problem. Recently some have expressed fears of the inability of "integrating cumulative results from independent samples for regional scale questions "(Fish and Kowalewski 1990:4). It was, in part, because of these real concerns that the majority of data utilized in this study are derived from the same project. It was felt that that, like Kelly stresses, "while large-scale patterns may be less sensitive and less fine-grained, I suspect that they will prove more real and meaningful --in statistical language, they will be less precise, but more accurate (1994:314). Similar archaeological perspectives, even to a significant degree the same personnel involved in these different projects, argues for a greater uniformity in recognition of artifacts and recording of pertinent data.

Research within the framework of cultural resource management is frequently required to conduct non-random surveys (Goodyear *et al.* 1979). Regardless of the approach taken, "the very act of survey, because it is not controlled in all its aspects, builds biases into the resulting data" (Dunnell and Dancey 1983:278). It is for the archaeologist to recognize the extent of such biases and gauge their effect on research.

The past decade has seen an increasingly sensitive examination of the role of survey in archaeology. The most basic tenets of earlier theoretical perspectives have been called into question, for example,. the concept of the site. Whether using sampling theory or predictive modeling, arguments run the gamut from siteless (Dunnell and Dancey 1983, Ebert *et al.* 1987) to timeless surveys (Larralde 1988) or both (Thomas 1975).

Regional studies, particularly surveys, invoke arguments regarding sample size, site definition, predictive models, even the wisdom of utilizing surface sites for the elucidation of settlement and subsistence patterns. While it cannot be denied that surface sites are subject to destructive natural processes and the packrat urges of the collector, excavated sites are not *a priori* less disturbed than surface sites. It should be borne in mind that today's excavated subsurface site originated as surface assemblages, subject to many of the same destructive influences over the course of similar time periods. "It is our contention that *the surficial distribution of artifacts constitutes an appropriate source of archaeological data independent of subsurface remains*" (Dunnell and Dancey 1983:270, emphasis theirs). Such surveys are particularly useful in the semiarid regions of the Great Basin and High Plains with their lack of ground cover and concomitant high site visibility.

In much the same vein as regional studies discussed above, Thomas (1989) argues that the slope of a regression line describing the relationship between assemblage size and diversity is dependent type of site: residential, logistical, or diurnal. Thomas suggests that steep slopes characterize residential sites, less steep slopes, logistical sites, and the lowest of slopes, diurnal sites. Since assemblage size and diversity are quantifiable and capable of producing robust patterns of activities recommendations to conduct such research have been forthcoming (Kelly 1994:134)

Although archaeologists (Frison 1978; Odell 1985) have appealed for development of methodologies that could incorporate the smaller, more ephemeral sites in subsistence strategy, the discipline has far to go. For the most part sampling is still recognized as biased toward "the densest, most highly visible, and most clustered aspects of the archaeological continuum" (Wobst 1983:73).

It is for these reasons, among others, that the data here have been collated from full-coverage surveys. Some adherents of this method recommend full-coverage survey over all else. For them it "is an actualization of the basic survey paradigm, the settlement pattern, insofar as that pattern is expressed by observable surface remains" (Fish and Kowalewski 1990:2). It is also recognized that the use of any predictive model of settlement patterning, no matter how efficient, can predict only surface evidence and does not take into account subsurface sites.

The word "observable" quoted above has also left the author uncomfortable for another reason regarding settlement/subsistence patterns. Essentially, our only evidence of such patterning remains the lithic debitage or discarded stone tools most often used to infer hunting or butchering activity. The females' contribution to the subsistence of a hunter/gatherer band, with their plaited baskets, wooden seed beaters and digging sticks known from ethnohistoric accounts (Steward 1938) disappear, for the most part, from the archaeological record. It is only evidence from the rare excavation of dry caves with their recovery of well-preserved nets, baskets and wooden implements that occasionally puncture the complacency of some archaeologists who perceive the archaeological record in terms of lithics alone. One can even construe the available evidence as gender biased because the available lithic evidence is most often used to infer hunting activity or territoriality. Both of these are most frequently associated with male activities.

Understanding site formation processes is necessary to better recognize the potential biases to be taken into account for quantitative research (Lewarch and O'Brien 1981:299). It is acknowledged that no matter the intensity of survey some sites will not be recorded. Earlier destruction, low artifact density, or alluviation all subtract from the archaeological record. At least one factor, the extent and duration of modern agriculture, is moot. South-central Wyoming has never been tilled.

Organization of Lithic Technology

In the past, many archaeologists working in the High Plains have offered the sudden proliferation of Late Prehistoric sites in southwestern Wyoming as direct evidence of a dramatic population increase (Mackey *et al.*1982). Evidence of this growth has been attributed to the burgeoning of CRM survey and testing programs from southwest Wyoming. Indication of the amelioration of the climate following the Altithermal (Antevs 1948, Bryson *et al.* 1970, Mackey *et al.*1982) and the expansion of the Fremont culture from the Great Basin into southwest Wyoming (Anderson 1983) have both fueled speculation regarding this population increase. In conjunction with this hypothesis is the conjecture that increased evidence of hunting activity is a result of increased population as well as a greater reliance on seed foods during the Late Prehistoric period (Smith 1988:251). Some have suggested that the apparent population increase is attributable to technological innovation such as the introduction of the bow and, to a lesser extent, the diffusion of ceramics from the Great Basin (Harrell 1989:27).

A review of models of Fremont culture history also points out the possible influx of cultural traits from New Mexico and Arizona regions and the subsequent effects of the introduction of ceramics into the regionally adapted Archaic peoples in the northeastern Great Basin before A.D. 500 (Anderson 1982:19). Frison has been more circumspect, cautioning that the apparent surge in published Late Archaic radiocarbon dates may not reflect an accurate picture of the region. He warns that the energy resource surveys which provided the radiocarbon dates are not equally distributed. Although Frison speculates that something ecologically significant was occurring during this period, he, unfortunately, fails to specify what ecological occurrence took place. (1991:109).

The Deadman Wash site in southwest Wyoming suggests that large herbivore populations expanded as a result of a more mesic climatic regime towards the end of the Late Archaic and during the Late Prehistoric (Mackey *et al.* 1982:62). Metcalf (1987:252), using data from Deadman Wash, believed that the mesic episode drew to a close after about 650 B.P. In any case, there is an apparent upsurge in early Late Prehistoric radiocarbon dates.

The problem with this speculation is the circular reasoning used to account for the apparent increase in the numbers of radiocarbon dates. None seem to entertain the possibility of other explanations for the dramatic increase in radiocarbon dates during the latter portion of the Late Archaic and the beginning of the Late Prehistoric. Based on ideas regarding hunter and gatherer site formation processes (Binford 1979, 1980; Gramly 1980; Kelly 1985, 1995) an alternative hypothesis is offered to explain some of the increased numbers of Late Archaic sites. Ecological changes in conjunction with social adaptations could explain some of the apparent shift in population and land use without relying on a problematic correlation between radiocarbon dates and population growth.

I believe it is possible to demonstrate a significant shift in subsistence strategies between the Late Archaic and Late Prehistoric periods on the Wyoming High Plains as reflected by changes in respective organization of lithic technologies in the Washakie Basin. Inferences regarding settlement patterns from lithic technologies has gained substantial attention in the archaeological literature in the past decade. Studies concerned with lithic reduction sequences have been considered in light of prehistoric mobility (Binford 1979, 1980; Gramly 1980; Kelly 1983,1985,1995, Meltzer 1984; Eckles 1985; Andrefsky 1991; Amick 1994).

At a regional scale it is possible to assess quantitative and qualitative differences in stone tool assemblages, to recognize unique or extensive localities or their absence (Hofman 1994:350). In fact, recent appeals have stressed the need to develop a regional perspective for such studies both in general (Kelly 1994:133) and specifically in the intermontane regions of the Rocky Mountains (Ingbar 1992:173; Hofman 1992:219) and in southwest Wyoming (Ebert *et al.* 1987:167). Such regional approaches enable one to incorporate the more ephemeral sites, which heretofore have been excluded from discussion of settlement patterns because of their inability to fit into an operative subsistence model. Inclusion of these smaller sites is imperative if we are to develop practical settlement models incorporating the low density sites which comprise a major portion of any settlement system, but which have been so long ignored.

Organization of technology has been defined as process in terms of how groups pragmatically view their gear "with regard to the planned execution of their adaptive strategies (Binford 1979:261). Binford (1977, 1979, 1984) has sought understanding of the technologies within cultural systems that are internally differentiated with respect to the design, manufacture, use, maintenance, and discard of tools in regard to their conceived role in the technology.

Recent archaeologists have followed similar themes, but with a stronger economic basis. Nelson, for example, defines organization of technology as

> the study of the selection and integration of strategies for making, using, transporting, and discarding tools and the materials needed for their manufacture and maintenance. Studies of the organization of technology consider economic and social variables that influence those strategies (1991:57)

These studies provide more than a simplistic typological assessment of tool categories. Inferences regarding past behaviors can be drawn from a reconstruction of the context of prehistoric procurement, manufacture, use, and discard (Amick 1994:9). Comparing and contrasting tool assemblages on a broad regional and temporal scale allows incorporation of multitudes of sites which have all too often been neglected in the past. Deriving inferences of past responses to both environmental as well as cultural shifts as reflected in lithic studies is particularly well suited for large scale surface surveys because organization of technology studies have the ability to incorporate larger site populations.

From an archaeological perspective, Kelly's discussion of organization of technology has been of singular importance. The recognition that lithic analysis must move beyond discussion of typological and reduction stages of stone tools has moved the discipline into new areas of relating organization of technology studies to a regional perspective. Replication of debitage classification eluded investigators for decades, reducing their ability to compare and contrast, or derive meaning from comparative lithic assemblages. Kelly (1994), for example, praised the efforts Sullivan and Rozen (1985) to develop a simple flake classification system for replication studies. Although other methods (Ahler 1989) have been demonstrated to be more efficient, the ultimate goal has been to establish comparative methods easily adoptable by researchers around the globe.

Models of adaptive behavior can be constructed to measure responses to ecological change and the corresponding cultural systems adopted in terms of tool assemblages. Consequently, studies of organization of technology can provide insight into cultural responses to environmental change. This evidence "offers a perspective and methodology that helps us understand how hunter-gatherers make decisions about interacting with their environment and how these decisions affect the transmission of cultural traits (Kelly 1995:63)."

By focusing analytical techniques on variability among different categories of artifacts, it should be possible to distinguish between patterned shifts in prehistoric subsistence systems in the intermontane basins of southwestern Wyoming. At the most basic level, the presence or absence of artifact categories can demonstrate change in settlement systems through time, measuring shifts in frequency of artifact classes at a regional level. It is, after all, the temporal factor that offers archaeology as a unique laboratory for the investigation of long term behavioral responds to environmental change.

Although not the first (cf. Luedtke 1976), it has been Lewis Binford's exposition of hunter/gatherers, their tools, and site formation processes that has provided much of the current basis for contemplating how prehistoric peoples organized their technology in regard to their economic and social needs as they responded to their environment (e.g. Binford 1973, 1977, 1978, 1979, 1980). The concept of formalized and expedient tools as contrasted with ethnographic descriptions of 'personal' and 'situational' gear of the Nunamiut Eskimo suggested a model of measurable prehistoric mobility (Binford 1979).

Personal gear includes those items carried by individuals in anticipation of future need. Nunamiut personal gear was recycled, reused, and maintained through expenditure of time and effort (Binford 1977:33-34). Because such effort is expended on these items they are always inspected before going into the field and either repaired or replaced. For this reason, Binford (1979) asserts that discarding personal gear is related to its use-life and that these items are generally discarded in a residential camp, not in the field.

Situational gear, on the other hand, is expedient in nature. Acquisition, use, and discard all occur in a relatively short period of time. Frequently, expedient tools are manufactured at the time of need with little or no formalized preparation of the tool and once used, as quickly discarded. A flake struck from a bifacial core, used unmodified, and dropped at the task site exemplifies the situational nature of this tool category. The strong relationship between available raw material and expedient tools provides a useful corollary to these two types of tools. In areas of plenty, like the abundant raw materials in the Wamsutter region, expedient tools are easily acquired. The curation of exotic (non-local) material can be used to address levels of mobility diachronically.

These concepts point to a better understanding of the true continuum of what has all too often been characterized as a dichotomy between foragers and collectors and the subsistence strategies developed to fit within a respective environmental framework. As defined by Binford, hunter-gatherers `map on' by moving consumers to resources, or they may move resources to consumers `logistically' (1980:17)." Differences in corresponding lithic assemblages are detectable between the two ends of this hunter-gatherer spectrum. Studies indicate an association between amounts of effort expended in tool production and settlement systems. Time and again this association identifies sedentary prehistoric peoples with expedient tools and mobile populations with formalized tools and that "Binford's forager-collector continuum makes the case that mobility is related to the environment (Kelly 1995: 120)).

Core Technology

The relationship between core technology and settlement patterns has been examined in some detail by Parry and Kelly (1987), Johnson (1987), and Kelly (1988). The correspondence between increased sedentism and a decline in use of prepared cores was suggested by Parry and Kelly in four separate localities across North America, including the Eastern Woodlands, Plains, Southwest, and Mesoamerica. Importantly, they addressed occurrences of amorphous cores among mobile groups in areas of plentiful supplies of lithic material. Generally, it has been emphasized that more mobile populations utilize bifaces as cores for further tool production. Goodyear (1979) and Kelly (1988), in particular, have stressed the use of bifaces as cores. Bamforth (1986) first demonstrated the greater efficiency of bifacial cores. Their greater ratio of working edge to weight coupled with the need to curate tools over distance created the more efficient tool. However, this model of efficiency rests on the assumption of scarcity of knappable stone. Gramly's (1980) research in Maine asserts that, In areas of plenty, there is little need for curation.

It is the decrease in use of bifaces as cores which provides the best evidence for the change to tools produced with less effort. This shift in organization of lithic technology is linked to the degree of mobility within the society and the degree of planning involved (Kelly 1988). Kelly, addressing the contrast between the mobility of bifacial and percussion cores, stated

> While a percussion core may be used in the same fashion as a bifacial core (i.e., transported and used as a source of flake tools), its use suggests less concern with, and probably less need for, planning for all future conditions (1985:132).

Tools with facial retouch fit the same definition because they require more effort to maintain. The corollary is an increase in utilized flakes in later sites as more expedient tools are used. Other inferences deduced from shifts in lithic technology should measure costs by a number of factors, including the rarity of the raw material, the difficulty in procurement (crossing territories claimed by other groups), a correlation between the elaboration of the tool and distance from the material source, and the number of manufacturing stages to produce a finished tool (Shott 1989:20). For example, casually procured tools would not be expected to be found far from their source (Francis 1980:5).

However, even Binford's (1979) long held assumption that expediently produced tools would not be found far from their source has been questioned by contrary data from the Laddie Creek site , a stratified site located on the western foothills of the Bighorn mountains in north-central Wyoming. Evidence recorded from the Laddie Creek site excavations ranged from the Late Paleoindian Cody Complex (8800-84 B.P.) to Late Prehistoric Crow Pottery. The single largest sample from the site is represented by Early Plains Archaic lithic assemblages where retouched flakes were demonstrated to be from distant lithic sources at higher elevations (Larson 1994:63). Similar retention of expediently produced flake tools has been noted among New Guinea highland societies and among the !Kung San (Kelly 1985:132).

More mobile groups tend to curate their formal tools because of the effort expended in producing them, but it is also possible that readily available lithic resource in areas of abundance could produce an expedient tool technology even in a highly mobile society. Evidence of this interrelationship between lithic resource availability and settlement systems has been made archaeologically (Wiant and Hassen 1984; Johnson 1987) and ethnographically (Gould 1980; O'Connell 1987). One further note useful in understanding the evidence from the Wamsutter area is the concept of `embeddedness' as proposed by Binford (1979). Simply stated, Binford proposes that acquisition of lithic material for tool production is generally embedded in a broader subsistence scheme. Collecting strategies recognize the inefficiency of seeking out knappable stone for tool production as a single minded goal. It is more efficient in acquiring raw materials for tool production as part of a greater round of subsistence activities. If such a concept as embeddedness is accepted, then it might be possible to recognize shifts in settlement patterns when the percentage of locally available lithic material decreases or increases, regardless of the mode of tool production and organization, formal or expedient.

However, such an idea does have its detractors. Yerkes states,

> in areas where lithic raw materials are abundant, there would be more evidence of core preparation and conservation of lithic materials among mobile groups than among sedentary groups (1989:185).

Many factors, only some of which have been touched upon here, contribute to the final arrangement of a tool assemblage. Although the correlation between settlement strategies and tool production has been demonstrated in regards to the continuum between mobile and sedentary systems, I feel that finer shifts of subsistence strategies within mobile hunter/gatherer societies can also be detected by examination of characteristic traits of lithic assemblages. Binford, as discussed above, addressed this issue in his discussion of forager versus collection strategies of hunter/gatherer societies. Foragers move from place to place, having 'mapped on' to available resources in a region. Collectors utilize a broader spectrum of specialized sites such as hunting stations, caches in addition to procurement locations, and residential bases common to both collectors and foragers as specialized groups acquire, then cache or move the resource to the main group (Binford 1980:7-10).

Chapter III

South-Central Wyoming: Environment and Geography

Location and Physiography

The project area comprises portions of Townships 17 North through 20 North, Range 93 West (Figure 1.2), a total of 71 square miles (184.5 square kilometers). For ease of communication, the project area will hereafter be referred to as the Wamsutter area. This area stretches northward from the Washakie Basin, across the Continental Divide, and into the Great Divide Basin. In this region the Continental Divide is barely discernible from the nearby ridges and dune crests as it stretches east to west across the elevated basins. The Great Divide Basin and the Washakie Basin are portions of the larger Wyoming Basin which covers the southwestern portion of the state (Fenneman 1931). The Great Divide Basin is a true topographic basin, a large syncline between the Rawlins Uplift to the east and the Rock Springs Uplift to the west. These uplifts provide internal drainage's that channel surface runoff into the internal hydrological pattern where they evaporate, infiltrate the groundwater, or flow into the playa lake systems found in the western portion of the basin. The Great Divide Basin encompasses an area of about 10,878 square kilometers (Brown 1980). Topographically, the southwestern portion of the Great Divide Basin is referred to as the Red Desert, which frequently leads to confusion in the archaeological literature when the two names are often interchanged.

The Washakie Basin, while not a true topographic basin, still has morphological features similar to those of the Great Divide Basin to the north with numerous mesas, buttes, and cuestas. It covers about 6734 square kilometers and, although the westernmost portion of the basin drains into the Green River to the west, most drainage flows southward into the Little Snake River just across the Colorado border. To the southeast, the Sierra Madre Mountains form the eastern border of the Wyoming Basin (Lageson and Spearing 1988).

Of particular concern for this study is the rather extensive series of playas immediately south of Wamsutter. These playas (Dry Lake, Fivemile Lake, and Eightmile Lake) are distributed in chain-like fashion east of the Delaney Rim. East of the playas are a series of small hills and ridges trending east to west and separated by shallow, steep-sided arroyos or ephemeral channels which carry water only during periods of increased precipitation. The extensive playa basin is flat-floored and contains silts and clay sediments which form gumbo soils. With the addition of sufficient water from snow melt and early summer rains, the flatter regions can quickly mire unsuspecting animals or archaeologists. All the playas hold water during the spring, but as the summer progresses, the water becomes shallower and more alkaline, although the author, in 1980, observed a herd of wild horses drinking from Dry Lake in mid August. It should be pointed out that Dry Lake is the recipient of subsurface water from Echo Springs, a major freshwater spring which lies to the east of the playa basin.

The landscape of the Wamsutter area is dominated by flat basins containing small playas, broad surrounding floodplains, and by rolling hills and ridges to the east of the playas which gently slope westward toward the

Delaney Rim. In times of heavy precipitation ephemeral streams flow at the surface. Arroyos such as Coal Gulch, Antelope Creek, Coal Bank Wash, and Standard Draw, downcut the westward sloping terrain to the east . Echo Springs, a perennial freshwater spring, contributes consistent water to the immediate environment (Sender et al. 1982:10) Relatively speaking the land surface is flat, varying in elevation between 2,010 and 2,164 meters.

Surface Geology

Tertiary rocks of the Wasatch and Green River Formations comprise the bedrock and various outcrops throughout the Wamsutter area. These are composed of various members of mudstones, shales, and siltstones of the Green River Formation and siltstones and sandstone units of the Wasatch Formation. Differential erosion of these sedimentary rocks forms the typical badlands appearance of the region. Outcrops of various sandstones and siltstones are common on the ridgetops and hill slopes throughout the region. In much of the area sand dunes and dune complexes overlie the weathered bedrock. It is believed that the parent material for these eolian deposits is obtained from the exposed step-like ridges of siltstones and sandstones of Tertiary age found further to the west (Surdam and Wolfbauer 1975).

Lithic Resources

Knappable raw material for stone tools in the form of outcrops or cobbles abound in the Wamsutter region. Cherts of various types characterize the majority of available raw material. The most frequently encountered lithic materials in the Wamsutter region are bioclastic and oolitic cherts, with algalitic cherts comprising a smaller category.

Bioclastic chert is composed primarily of broken bits of shell. During the three Wamsutter field seasons between 1979 and 1981, this material was commonly referred to as fossiliferous chert. The matrix in this chert ranges in color from off white, to dark brown, to gray, to gray and brown banded. The cortex is generally rough textured and deep brown in color. Weathering often produces an orange hue on exposed rock surfaces. Quality of this material is fairly uniform throughout the Wamsutter region (Michaelson 1983:13).

Bioclastic chert outcrops within the Green River Formation in the Washakie Basin (Roehler 1973). Cobbles, in the form of desert pavement, litter the wind eroded surfaces of interdunal areas in the southern half of the project area. While these cherts are found in the same formation further west in the Green River Basin the knappable quality is consistently better in the Washakie Basin (J. Miller 1991:468)

Oolitic chert consists of concentric laminae of calcium carbonate containing a nucleus of a bit of quartz or shell. The chert matrix ranges in color from light to dark brown with the oolites generally being lighter in color. The cortex of nodules is rough textured and ranges from tan to dark brown in color. The quality is somewhat variable, but is generally knappable.

Oolitic cherts outcrop within the Green River Formation. The outcrops are laterally discontinuous and are confined to the ancient strandline deposits of the Eocene Lake Gosiute (Surdam and Wolfbauer 1975:343).

Algalitic chert is composed of tan colored stromatolitic algal structure surrounded by a brown to dark brown matrix. Impurities, in the form of alternating bands, are sometimes present in some pieces of this material. The cortex is generally rough textured and varies from light tan to gray in color. Quality of these cherts, unlike those previously discussed, is quite variable.

Algalitic chert outcrops within the Green River Formation (Michaelson 1983). The algal beds were deposited in very shallow water along the ancient shoreline of Lake Gosiute (Surdam and Wolfbauer 1975:340-341).

Occasionally cobbles of algallitic chert are found in association with outcrops of oolitic chert. Michaelson (1983) specifically positions one occurrence of the two chert types 16 km west of the Wamsutter project in the Red Desert region. However, it should be noted that neither algalitic chert nor oolitic chert are ever found associated with bioclastic chert.

Petrified wood of knappable quality is found within the olive green sandstone bed of the Adobe Town Member of the Washakie Formation (Roehler 1973:15-16). The Haystack Mountains a short distance to the east of the Wamsutter project yield high quality material. The silicified wood ranges in color from gray to black with light gray or tan bark.

All of the aforementioned cherts were recovered in great quantities during the Wamsutter survey. Pieces of petrified wood were identifiable although not in great numbers. Their scarcity caused them to be lumped under the category of exotic material.

Non-local Lithics

A brief exposition of the non-local lithic material recorded on many of the sites in the Wamsutter project is warranted. In general, non-local lithics were grouped together when compared to dated assemblages of identified materials. Deriving descriptions of materials from the site forms included many cases of lithic material labeled as unknown. The following is an incomplete list of non-local lithic material recorded during the Wamsutter survey:

Obsidian: This readily identifiable material was documented at 24 sites. None of the artifacts were recovered from Paleoindian or Early Archaic sites. Only 25% of the sites were of unknown affiliation. The remaining 75% of the artifacts were recorded on multi-component (11) or single component (8) sites ranging temporally from the Middle Archaic through the Late Prehistoric Periods. Although obsidian is generally attributed to sources in Yellowstone or Teton Pass, obsidian pebbles are present along the western edge of the Green River Basin (Latady 1986:141) The small quantity of obsidian recorded in the Wamsutter project corresponds with other findings from around the state where obsidian was never extensively used but appears to have been more popular during the latter portion of the cultural sequence (Zier *et al.* 1987:312). For example, the historic Northern Shoshone prized every piece of obsidian they could obtain as long as it held a sharp edge (Lowie 1909:173).

Black Butte Quartzite: A large amount of debitage of this material was documented at 48SW1950 in the northern portion of the Wamsutter project (Creasman *et al.* 1982). This fine grained dark quartzite is found at Black Buttes and Aspen Mountain 50 miles to the west in the western Wyoming Basin (J. Miller 1991:466). This material has been documented at a multi-component site on the northern edge of the Great Divide Basin, 80 miles from its source (Newberry and Hoefer 1987).

Moss Agate: A total of 19 sites were described as possessing agate or moss agate debitage. Although agates are described as rare in archaeological context because of their poor flaking quality they have been recorded in the Green River Basin (J. Miller 1991:451). It is notable that, as in the case of obsidian, the majority of documented sites in the Wamsutter project (73.4%) date from the Middle Archaic to the Late Prehistoric.

Tiger Chert: At least one large bifacial knife was recorded of this material. The bulk of these cherts are black, dark brown , or medium brown and distinctive because of their banding. There are at least two sources of this material; the first is near Cherokee Springs, about 2 miles west of Rawlings, Wyoming (Miller, M. *et al.* 1991:50), and the second is located in the Bridger Basin in extreme southwestern Wyoming (J. Miller 1991:467)

Steatite: Two sites contained artifacts manufactured from steatite. One site, 48CR727, possessed a single large sherd of steatite. Site 48SW1948 yielded a carved steatite pipe. Steatite is a metamorphosed talc and is soft enough to be carved with stone tools. Steatite outcrops occur in the Teton, Wind River, and Bighorn Mountains and all exhibit extensive quarrying . Frison states that "carved steatite vessels occur all of the area but seem to increase in frequency to the north and west especially in the Green River Basin, the Upper Snake River drainage, the Absoroka Mountains an upper Yellowstone River drainage (1978:67)." James C. Miller refers to some geological outcrops in the Eocene Green River Formation but continues by stating that "there is no evidence yet to indicate that it was used prehistorically (1991:455)."

Crystal Quartz: Six sites yielded crystal quartz. Beyond the recovery of these artifacts, function or purposes cannot be explained. Although quartz crystals are common in the West archaeological literature for Wyoming fails to mention it.

Geomorphology

Based on the results of geomorphological field analysis of landforms which will be discussed in further detail below, the Wamsutter area can be delimited into three areas. These areas include the following:

1) a northern portion, represented by bedrock-controlled uplands and eolian concentration that form relatively recent sand dunes and dune complexes containing buried Late Archaic to Late Prehistoric artifacts, 2) a middle portion centered at the southern part of the playa basin system, 3) a southern portion lying south of the Continental Divide along the broad floodplain of North Barrel Springs Draw (Sender *et al.* 1982:12).

Throughout the Wamsutter area the eroded sedimentary rocks are overlain with more recent, Late Quaternary deposits. Primarily these deposits are in the form of sand dunes, some of which form extensive networks of coalescing dunes interspersed with erosion gaps and `blowouts.' They contain significant amounts of cultural material indicating a proclivity of the prehistoric inhabitants for utilizing these landforms for various purposes. Such evidence of prehistoric occupation of sand dunes is found throughout the West and Southwest (Irwin-Williams 1988:44). In some areas, especially the North Barrel Springs Draw, alluvial deposits are covered by dunes of moderate relief and eolian sand flats. They commonly contain Late Archaic to Late Prehistoric cultural material and are thus interpreted to be of relatively recent origin (Sender *et al.* 1982). Such an interpretation can be questioned, since Ahlbrandt (1974) found evidence that the Killpecker Dunes Fields of the Great Divide Basin northwest of the Wamsutter area dated at least as long ago as the early stadia of the Pinedale Glaciation.

Extensive lacustrine sediment with interlayed alluvial lenses is a ubiquitous feature of the area. Fine silt and clay playa deposits are found well beyond the present playa lakes, extending 14 meters higher than current levels. These lacustrine deposits are found 0.8 km. east of Eightmile Lake and indicate that, in the past, the group of playas formed a single, large lake at the end of the Pleistocene.

The sedimentary stratigraphy around the playa lakes suggests that climatically controlled lake fluctuations occurred throughout the Late Quaternary. Ice wedge casts, formed when sand filled cavities left by melting ice at the end of the Pleistocene, were recorded during one of the pipeline projects which crossed the Wamsutter area (Sender *et al.* 1982:18). The significance is that they provide evidence of permafrost conditions during the Late Pleistocene. They form when the mean annual temperature is -6° to -8° C, or colder, ample proof of the arctic-like conditions present in southern Wyoming at the end of the Pleistocene.

Soil Characteristics

In the Wamsutter area analysis of buried soil horizons, where preserved in conjunction with cultural remains, indicate paleoenvironments different from those found today. Those factors which have combined to bury soil horizons unfortunately are the same factors which destroy such evidence in other locations. In most cases only the very strongest soil properties are found in buried paleosoils.

Semi-arid climatic conditions with sparse vegetation combine to produce weak soil horizons that are easily disturbed by the modern environmental conditions. Entisols and aridisols are common. Active sand dunes are found throughout the region and can quickly cover slow-forming soils; active dunes also expose earlier soils, subjecting them to wind-driven erosion. Eolian deposits, in some areas exceeding 2 meters in depth, are believed by some to have accumulated since the end of the Paleoindian period (Miller 1982:11).

Climate

The current climate of south-central Wyoming is classed as semi-arid, with a mean rainfall of 16.5 cm. as measured at Wamsutter (Table 3.1). The prevailing westerly to southwesterly winds of the High Plains are a significant factor in understanding site location/exposure for this region. The prevalent wind direction seems to have changed little since the end of the Pleistocene (Ahlbrandt 1974:52). During daylight hours, the wind is unremitting, occasionally blowing so fiercely as to halt survey work as the ground surface becomes obscured by blowing silt and sand. Mean annual wind speed is listed at 11 mph, but wind gusts are frequent and substantial (Miller 1982:12). These prevailing winds, coupled with the dry continental air masses, produce a high evapotranspiration rate which generally equals and sometimes exceeds the annual precipitation. During the summer months, high temperatures and low humidity cause rapid evaporation of the playa lakes, concentrating alkali minerals and salts in the soils. Thus vegetation growth is minimal. On the higher ground to the east xeric species persist, but in sheltered areas denser growths with a wider variety of species are found. The diurnal variation in temperature is substantial (Table 3.2), making the Wamsutter area, though not uninhabitable, at least uncomfortable during the winter months. The mean annual temperature at Wamsutter is 5.5° C. Winter snow contributes the majority of precipitation, usually in March and April. Late spring snows and early summer rains account for much of the moisture for the brief growing season. Late spring frosts and early fall frosts limit the growing season to 125 to 130 days.

Flora and Fauna

The vegetation of the Wamsutter area is characterized by desert/grassland ecozones which vary in relation to available water and the saline condition of the soil. The Great Divide Basin is characterized as a transition area between the grasslands of the east and the variable shrub savanna of the Great Basin (Beetle 1974:72). Generally due to the desert conditions vegetation is sparse. However, a variety of plant species can be found in the region.

Common sagebrush (*Artemisia tridentata*) is the predominant species of the uplands, along with plants such as bud-brush (*Artemisia spinescens*), Nuttal's salt sage (*Artriplex nuttallii*), winter fat (*Eurotia lanata*), rabbitbrush (*Chrysothamnus*), prickly pear cactus (*Opuntia polyacantha*), wheatgrass (*Agropyron*), and Indian ricegrass (*Oryzopsis hymenoides*). In areas of higher salinity, greasewood (*Sarobatus vermiculatus*) and different types of salt-sages (*Atriplex spp.*) are common (Sender *et al.* 1982). A number of these and other less common plant species have been important historically in the subsistence of the prehistoric inhabitants of the Great Basin and the High Plains as well (Steward 1938).

The introduction of domestic sheep during the latter half of the 19th century into south-central Wyoming led to a reduction in the occurrence of various grasses and winterfat, a preferred forage for these grazing animals (Flowers 1960:27). To a lesser extent, cattle and horses are grazed in the region, even in winter because the winds keep the ground relatively free of deep snows. Several herds of wild horses are found in the region as well. All

Table 3.1. Precipitation Data, Wamsutter, Wyoming

MONTH	Precipitation	Snowfall
January	.66	38.4
February	.96	16.8
March	1.2	13.2
April	1.5	2.3
May	2.2	.3
June	1.9	.3
July	1.5	T
August	2.0	0
September	1.5	T
October	1.5	5.6
November	.7	8.4
December	.9	11.4
ANNUAL	16.5	84.6

(T = Trace) All measurements in centimeters

Table 3.2. Temperature Data

Wamsutter Wyoming

Month	Maximum Mean	Minimum Mean	Diurnal Variation
January	-1.7 C. (32 F.)	-14 C. (4 F.)	5.5 C. (28 F.)
July	29 C. (84 F.)	9 C. (46 F.)	2.7 C. (38 F.)
Record High	66 C. (105 F.)		
Record Low	-45 C (-50 F)		

contribute to dramatically altering the natural composition of the plant communities in the Wamsutter area.

Of the native artiodactyls, the pronghorn antelope (*Antilocapra americana*) is the most prevalent. Mule deer (*Odocoileus hemoinus*), and to a lesser extent elk (*Cervus canadensis*), are found in the area. Currently, this portion of Wyoming is of singular importance as antelope hunting range for the state (Lageson and Spearing 1988). Although a few archaeological reports mention historical accounts of bison in the region as late as the 1920s, they do not seem to have been an abundantly common animal (J. Miller 1982). The Wamsutter project recorded archaeological evidence of only two bison. The paucity of recovered bison specimens from archaeological sites reinforces the belief that bison did not play a significant part in the subsistence of the area. A plant ecologist, contrasting the Big Horn Basin with its numerous recorded kill sites against the Washakie Basin, explains this paucity of kill sites as a difference in the plant communities. The Washakie Basin contains sand dropseed (*Sporobolus cryptandrus*) which has a low animal palatability and lacks blue grama, a highly nutritious grass found abundantly in the Big Horn Basin. Grazing bison would have been restricted to the Washakie Basin in spring and early fall (Marlow 1982:349).

There is a wide variety of smaller mammals, including Richardson's ground squirrel (*Citellus richardsoni*), white-tailed prairie dog (*Cynomys gunnisoni*), jackrabbit (*Lepus townsendi*), and cottontail rabbit (*Sylcilagus spp.*), all of which are very common. Almost all of the small mammals present in the Wamsutter area are fossorial (burrowing) animals. They account for the majority of disturbances of the land's surfaces of the area, since agriculture has never been practiced in this region.

The carnivores are represented by the coyote (*Canis latrans*), several species of hawks (*Butronidae*), and the golden eagle (*Aquila chrysactos*).

Reptiles such as the prairie rattlesnake (*Crotalus viridis*) and desert horned lizard (*Phrynosoma douglassi*) inhabit this region, along with species of toads and other lizards. The sage grouse (*Centrocercus urophasianus*) is frequently found, and various species of ducks and geese migrate through the area twice a year.

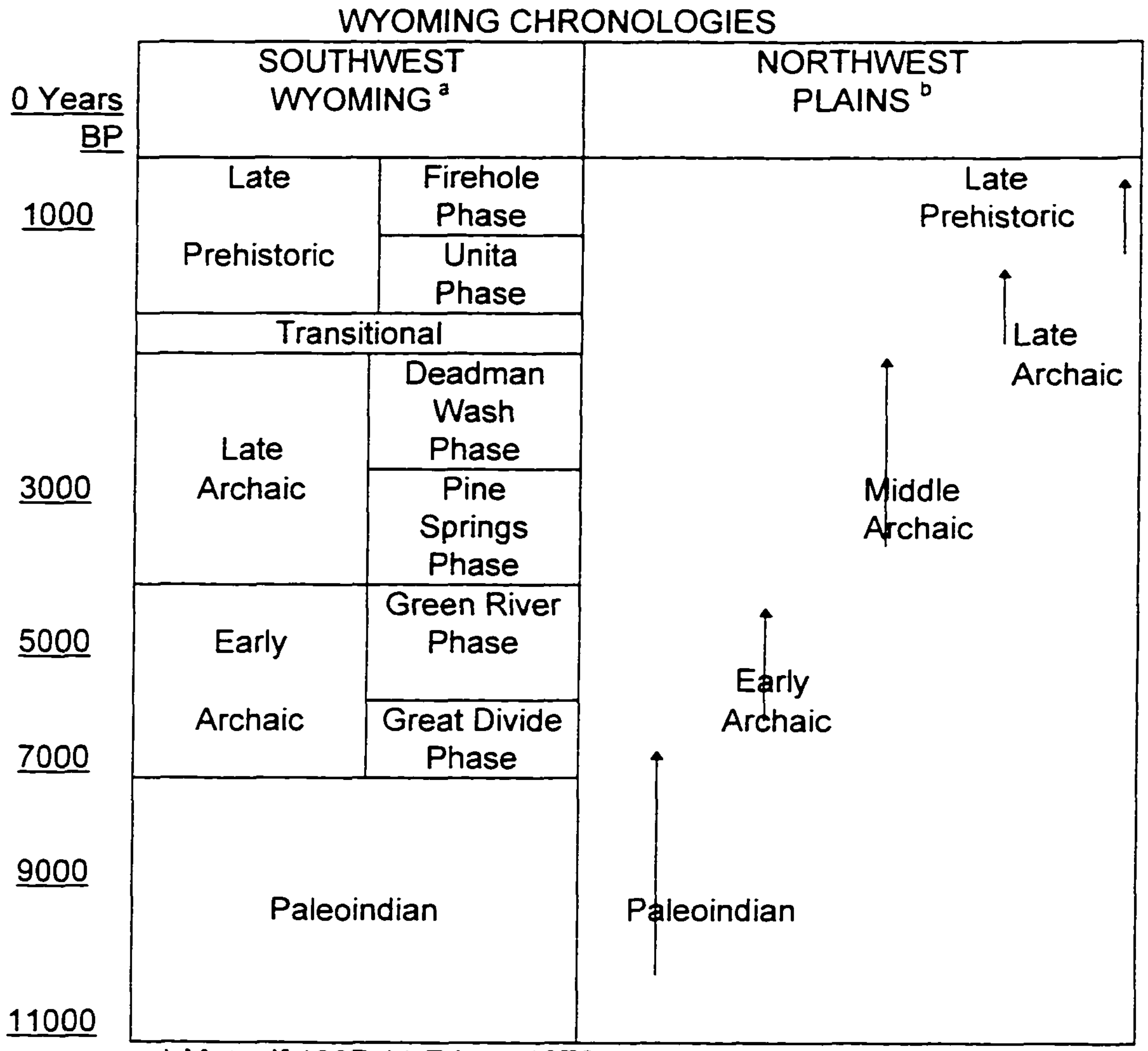
In summary, the Washakie Basin can best be described as a typical High Plains intermontane basin. The region is dominated by flat playa basins, broad floodplains bordered by rolling hills that rise to the east and north and a sharply demarcated questa to the west. Sand dunes form networks of transverse and other irregular dune complexes that shift and rise and fall at the whim of persistent west winds. Harsh winters maintain a long grip on the land, punctuated by a brief wet season during the late spring and early summer. In turn, the brief wet season is followed by an almost equally short hot, dry summer. All in all, the region can be rather inhospitable except to those familiar with the short-term ebb and flow of resources and are equipped with the cultural and technological skills to acquire the necessary resources.

Chapter IV

Wyoming Prehistory

The prehistory of Wyoming was initially developed from an examination of the cultural sequences of surrounding areas (Figure 4.1). Mulloy (1958) offered the first such chronology of the Northern High Plains, based on excavation of the deeply stratified Pictograph Cave site in southern Montana as well as the few stratified sites in Wyoming known at the time, such as the McKean site (Mulloy 1954). Although simple in design, Mulloy's chronology proved useful as it was constantly updated as more data became available. Building on Mulloy's pioneering efforts, Frison (1978) proposed a further refinement, adapting the concept of the Archaic stage as proposed for the Eastern Woodlands and Great Plains. In an effort to demonstrate the inadequacy of chronological sequences, Wright (1982) pointed out several significant gaps in the absolute dates since the end of the Paleoindian period by listing radiocarbon dates recorded from sites in the Northwestern Plains and the Central Rockies. In some ways, we have yet to move beyond the admonition of Caldwell and Henning regarding the Plains that "we are faced with cultural units that are no more than projectile point types or, in the case of bison kills, important but one-sided aspects of regional economies (1978:136)."

Recognizing that horizontal time boundaries are arbitrary and subject to the vagaries of environmental constraints, Frison (1991), in his comprehensive overview of Wyoming archaeology, stressed how the prehistoric economic



a) Metcalf 1987 b) Frison 1978

Figure 4.1. Wyoming Prehistoric Chronology

adaptations found in the Wyoming High Plains differed from the more traditional view of the Northern Plains. Further north they relied more on hunting large game animals, even though they too are referred to as following an Archaic lifeway. Influence from the Great Basin as the environment fluctuated through time cannot be discounted. Recently, investigations in the Wyoming Basin have demonstrated an inadequacy of the tripartite division of the Early-Middle-Late Plains Archaic for the southwest portion of Wyoming. Instead of using Frison's (1978) chronological sequence or Heiser and Hester's (1978) review of Great Basin chronology, local data in the form of radiocarbon dates were summarized into a localized cultural history (Metcalf 1987). Because of the confusion wrought by the appearance of Great Basin elements in the chronology of the Wyoming Basin, Metcalf proposed that the Early Archaic, dating from 7200 to 4600 years B.P., should be divided into a Great Divide phase and a Green River phase. Based on the distribution of radiocarbon dated sites of the region many now forego Frison's Middle Plains Archaic. Instead they propose a Late Archaic phase divided into a Pine Springs phase and a Deadman Wash phase, both exhibiting characteristics of Great Basin cultures. Though Frison (1991:21) does not deny the possibility of Great Basin influence in southwestern Wyoming and, thus, the necessity of a different chronology, he does point out the difficulty in explaining Middle Archaic McKean Complex sites, clearly affiliated with the Plains, in the region.

As early as the 1970s, Frison recognized a technological difference between the intermontane basins of northern and eastern Wyoming as compared with southern Wyoming. Originally he labeled the difference a "Technofacies," based on lithic tool manufacture (Frison et al. 1974). He later came to recognize the variation in terms of regionally specific differences in settlement/ subsistence patterns between the mountain/foothill ecosystem and the intermontane basins and High Plains during the Late Paleoindian period (Frison 1992:333). This dichotomy between subsistence patterns was initially thought to be exemplified by a culture represented by Pryor Stemmed projectile point manifestations found in the high mountain meadows of Wyoming's Big Horn Mountains and the mountains of southern Montana. The Pryor Stemmed complex is characterized by a reliance on a wider range of resources than earlier Paleoindian cultures. For example, butchering sites contain far fewer large remains and evidence suggests winter kills with storage of butchered meat by freezing. This pattern contrasts sharply with later Archaic and Late Prehistoric reliance on summer and early fall kills which utilized drying of meat for later consumption. However, in the past decade surface finds of Pryor Stemmed points throughout intermontane basins in southern Wyoming argue for a much wider occurrence of this ecological adaptation. One such projectile point was identified by Frison for the Wamsutter area while examining a sample of material collected during a brief visit to the field camp. In much the same vein, Michaelson (1983) makes much of the difference in intersite variability between the Powder River and Washakie Basins. This difference will be addressed in greater detail in a later chapter.

Paleoindian 12,000 - 7300 B.P.

To the archaeologist familiar with the High Plains, Wyoming conjures up images of Paleoindian hunters so ably described by Frison, either alone (1974, 1984, 1992) or in collaboration with others, in numerous books and monographs (Frison and Bradley 1980, Frison and Stanford 1982, Frison and Todd 1986, 1987).

In southwestern Wyoming, it is a different matter. Beyond occasional surface finds of diagnostic projectile points, the archaeological record of southwestern Wyoming has yielded few Paleoindian sites. No Clovis sites have been recorded for the region. The only evidence believed to be contemporaneous with the Clovis period is the problematic Union Pacific site, a mammoth kill site, in Carbon County not far from the Wamsutter area. Remains of a single mammoth, exhibiting butchering marks, were found eroding from a wash along with a number of boulders out of geological context. Although no diagnostic artifacts were recovered, bifaces and thinning flakes were found, but the interpretation that the site represents an opportunistic slaying of a mammoth using boulders to kill a bogged down animal is speculative at best (Irwin et al. 1962).

A few small Folsom sites have been discovered in the Wyoming Basin (Frison 1991). Most recently a Folsom occupation identified in south-central Wyoming yielded two radiocarbon dates, 9950±150 B.P. and 9770±150 B.P. The limited assemblage of debitage, tools and bison bone suggested that the site was a secondary butchering area (Smith and McNees 1990). Though Paleoindian sites are rare, sites recognized as other than a kill site are rarer still. Consequently, this preponderance of kill sites and the corresponding lack of camp sites has skewed our understanding of Paleoindian adaptations at the close of the Pleistocene. One exception is the Pine Springs site (Sharrock 1966) which seems to have been a base camp containing a quarry and workshop. The lowest levels of this multi-component site were occupied during the latter portion of the period. A single date of 9695±195 B.P. was recorded for the site.

One of the earliest discoveries for the region, the Finley site in the Green River Basin, was a bison kill site containing at least 59 individuals (Frison 1991:185). Here, in an area of stabilized sand dunes near a spring, a number of broken Eden and Scottsbluff points were recovered in the bone bed. First reported in 1939, a portion of the site was excavated in the late 1940s (Moss *et al.* 1951). Subsequently, because of large-scale looting of the site and further erosion, additional excavation were undertaken in the early 1970s and again in 1987 in a effort to salvage as much data as possible before it had been completely destroyed (Frison 1991:184-186).

At one time it was suggested that part of the reason southwestern Wyoming had revealed little archaeological data was the lack of spectacular or multi-component sites (P. Miller 1980). Since then, of course, a number of multi-component sites have been identified. Far more important than Paleoindian kill sites which offer only a narrow perspective of their lifeways are the multi-component sites which have provided an important reconstruction of paleoenvironmental change. The Deadman Wash site (Armitage *et al.* 1982, Mackey *et al.* 1982) is of singular importance in this regard. Other important sites are the Bozner site (Reust 1983, Anonymous 1985) and the Teliaferro site (Craig and Creasman 1988). These sites have provided much needed clarification of the cultural chronology of the region.

Early Archaic 7300 - 5000 B.P.

The appearance of side-notched types of projectile points demarcates the abrupt change between the Late Paleoindian and the beginning of the

Early Archaic. The shift to a more xeric environment correlates with this settlement and subsistence shift. First recognized by Antevs (1948), the Altithermal produced a period of increased erosion and deflation throughout the West. Traditionally, the Archaic denotes the first significant appearance of plant processing and procurement as the resource base expanded. New subsistence strategies are suggested by the increased occurrence of grinding slabs and manos in the archaeological record (Frison 1978, 1991). For many years, it was believed that a cultural hiatus occurred in conjunction with the Altithermal in Wyoming (Mulloy 1958:12). Reeves (1973) suggested the plains and intermontane basins were abandoned because of drought. More specifically, Benedict and Olson (1978:148) expressed the opinion "that the floor of the Wyoming Basin was uninhabited, or else was part of the Great Basin culture area, during the Altithermal maximum." They believed the occupants fled to the higher mountain regions in an effort to exploit the resources preserved at higher elevations. In many respects, the Early Archaic is the most enigmatic cultural period for the region. Much of what we know of the Early Archaic is derived from excavation of caves and rockshelters in foothill or mountain regions of the state outside of the Wyoming Basin (Frison *et al.* 1976, Shaw 1980).

In the Wyoming Basin, multi-component sites such as the Deadman Wash Site confirm the stratigraphic unconformity which evidence the Altithermal (Armitage *et al.* 1982; Mackey *et al.* 1982). This climatic event marks the onset of dune formation as arid conditions and erosion increased at the onset of the Altithermal. At the Deadman Wash site, this early xeric period is characterized by alluviation and aggradation. A remarkable decrease in animal processing is temporally correlated with the first evidence of plant utilization. This subsistence change reflects the decreased carrying capacity of southwestern Wyoming and the resulting reduced forage and subsequent decline in large herbivores.

This early Altithermal erosional episode appears to correlate with the extinction of the large early Holocene species of bison, the size reduction of surviving bison populations, and a recognizable shift in emphasis from a hunting to gathering human subsistence adaptation (Armitage et al. 1982:7). This erosional event represents a xeric period between 7000 and 7500 B.P. which resulted in reduced vegetative cover, allowing marked erosion within Deadman Wash.

The localized stratigraphy of an upland ephemeral stream suggests that the period between the close of the Pleistocene and about 5500 B.P. is a period of alluviation and aggradation with minor episodes of erosion. Deposition of aeolian sands at the bottom of Deadman Wash marks the onset of post-Pleistocene dune formation (Mackey *et al.* 1982:31).

Frison (1991:88) suggests the lack of clarity regarding Early Archaic subsistence and settlement lies with the scarcity of material in undisturbed context. Erosional unconformities found in southwest Wyoming sites are offered as an explanation for the destruction of many Early Archaic sites. The earliest unconformity documented at the Deadman Wash site is dated between ca. 7500-7000 B.P. and the latest, found at Tenmile Draw, dates to ca. 4700-4500 B.P. These two unconformities, evidence of increased stream flow, demarcate the beginning and the end of the Altithermal as well as the height of the xeric climatic episode (Creasman 1987:285). The erosional unconformity found in these sites is offered as an explanation for the destruction of many Early Archaic sites. Such erosion may indeed have been responsible for the appearance of abandonment or substantial decline in population during the Altithermal by destroying occupation evidence in the floodplains. Reeves (1973) suggests that the lack of Early Archaic sites in the High Plains were a result of the Altithermal. In addition, the lack of a clear sequence of diagnostic typologies can and does contribute to mistakenly identified Early Plains Archaic projectile points that are found out of stratigraphic context. They are too similar to subsequent projectile point sequences of the Middle Archaic Period or, as in the case of cultural levels stratigraphically below Middle Archaic levels at Mummy Cave and Southsider Cave, "a number of projectile points were found that out of context could easily fit into the Late Plains Archaic"(Frison 1991:88).

The earliest evidence of living structures in Wyoming dates to the Early Archaic. Crude pit houses have been found during salvage excavations where portions of the structures had already been destroyed (Frison 1991:84). They are generally circular, sometimes with one or more central posts that suggest a conical or gabled roof. These structures are most often found in sand dune areas of the intermontane basins, but a note of caution is warranted. This is also where the most intensive modern earth-moving activities are located. Such activities undoubtedly skew the evidence. The pit houses commonly contain storage pits and grinding slabs, but there is a paucity of animal remains (Frison 1991:84). The possibility that such structures represent evidence of a greater degree of plant gathering and processing than heretofore acknowledged seems more than conjecture.

Middle Archaic 4900 to 3000 B.P.

The appearance of the Middle Archaic corresponds with the end of the Altithermal. Amelioration of the drought and the warming trend that occurred at the end of the Pleistocene led to an increase in bison populations in the Wyoming Basin. There are indications that the Middle Archaic climate ameliorated significantly over the previously xeric period. Cultural horizons at Deadman Wash exhibit alluviation caused by a less severe climatic regime with evidence of increased precipitation. Entrenched channels formed during earlier erosional episodes are rapidly filled and alluvial deposits cover the valley floor (Mackey *et al.* 1982:31). Sand dunes in southwest Wyoming are stabilized. Increased population density is suggested by an increase in radiocarbon dates (Mackey *et al.* 1982:62).

Culturally this period is most frequently characterized by the McKean Complex, a term used to describe a series of projectile points and associated tool assemblages first interpreted as a range of varieties from the McKean site in northeast Wyoming (Mulloy 1954). Designation of cultural complex to this assemblage has always been controversial and a classic battleground ground of the "lumpers" versus "splitters." McKean assemblages are widely distributed over the northwestern and northern Great Plains. A proliferation of grinding slabs and manos argues for the continued use of plant foods from the Early Archaic, but evidence points to the McKean groups as being accomplished bison hunters as well.

Frison (1991:89) makes much of the stylized forms of food preparation pits becoming more common during this period, arguing that the large, fire-cracked-rock filled pits were roasting pits, or ovens. These pits are often found in association with manos and milling slabs, leading some to suggest their use as ovens to roast vegetable foods (Keyser 1986:226). Others have argued that milling slabs could have been used to crush bones to produce bone grease (Tratebas 1985). Keyser (1986) examined the literature detailing 10 McKean Complex sites in an effort to demonstrate the importance of plant foods, but discovered little evidence of large-scale plant utilization. This lack of evidence was attributed to the lack of proper recovery techniques for a number of the sites (Keyser 1986:233). In any case, the wide variety of hearth types argues for different functional requirements through time (Schoen 1981d). Unfortunately, these hearth types are not diagnostic of any particular time period but rather exist unchanged from the Archaic Period to the time of European contact.

The most significant McKean Complex site for the Wyoming Basin is the Scoggin site, located in the extreme eastern portion of the Washakie Basin near Rawlins. The site dates to greater than 4500 B.P. Excavations uncovered a communal bison killsite using a pound where McKean lanceolate and Mallory points were recovered together. It should be noted that the recovered fauna remains displayed evidence of intensive marrow extraction, the long bones split to extract marrow and smaller bones splintered (Lobdell 1973, 1974). Contrasting the Scoggin site with other McKean bison kills to the north, it has been suggested that the complete butchering and the greater effort expended to maximize the resource yield may be due to the relative scarcity of large bison herds in the region (Miller 1985:136). This corresponds with later evidence of a lack of significant bison populations in the basin.

Other Middle Archaic sites are reported for the region. Component 2 of the Cow Hollow Creek site, a multi-component site in the Green River Basin, produced two dates assigned to the Middle Archaic, 3455±125 B.P. and 3355±70 B.P., but no diagnostic stone tools were recovered (Schock *et al.* 1982:101). At Deadman Wash McKean variants were found in Component 7 which dates between 2800 B.P. and 2100 B.P. Compared to other McKean sites, these dates are quite late (Armitage *et al.* 1982:4-8).

It is during this period that enigmatic stone circles make their first appearance. These circles, ranging in size from three to seven meters in diameter, are found throughout the region (Figure 4.2). Located on mesas, ridges, terraces, and any other topographic feature, they can be discovered almost everywhere loose stones can be found. Much has been written about these stone circles (Davis 1983). They have been labeled "tipi rings," used to infer religious practices, and for the largest of these "medicine wheels," as an astronomical observatory. Most of this terminology, unfortunately, is little more than speculation.

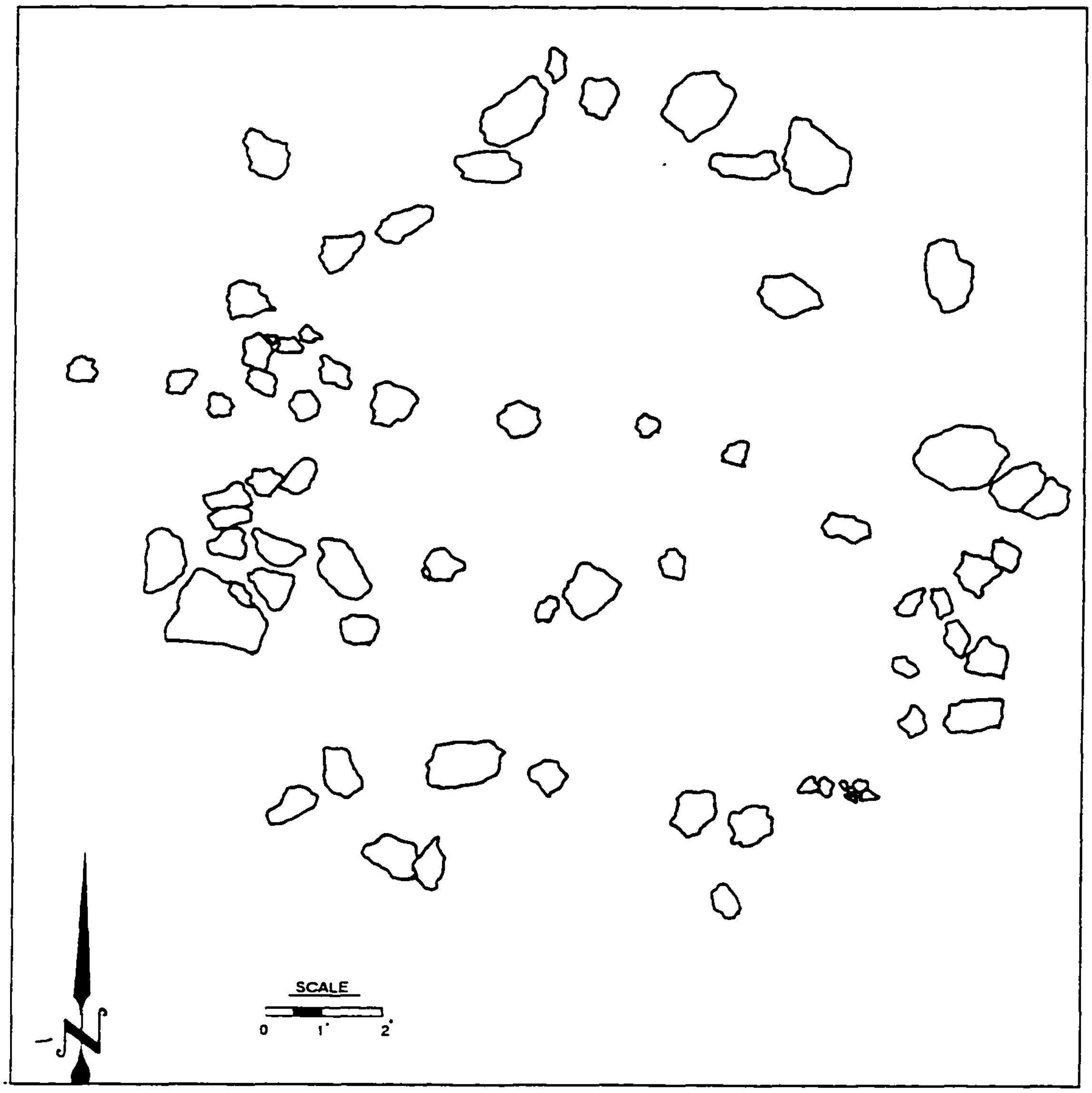


Figure 4.2. Typical Stone Circle, 48CR1772

Modified from the original site form, Rosenberg 1980a

Evidence of pit houses, the earliest dating to the Early Archaic, continues to be found. In 1983, a reexamination of the McKean type site on the Belle Fouche River in northeast Wyoming yielded evidence of a pithouse (Kornfield and Todd 1985). Others have been found in the Wyoming Basin itself (Frison 1991:98). A recent synthesis of archaeological recovery of pithouses examined 45 structures from 28 sites, most from southwest Wyoming (Larson 1997).

The most important synthesis of the McKean Complex was derived from a group of studies undertaken at the time of the second excavation of the McKean site in 1983 (Ingbar 1983, M. Miller 1985). Analysis of settlement patterns and distribution studies of lithic material in the Powder River Basin has played a strong role in better understanding the Middle Archaic Period.

Late Archaic 3000 - 1500 B.P.

The beginning of the Late Archaic corresponds with another xeric climatic episode with marked erosion and reduced vegetation for large herbivores. This was the second major period of degradation evidenced at Deadman Wash. A second sand dune formation period ensues simultaneously (Mackey *et al.* 1982:31). It is in the Late Archaic that the differences between the Northern Plains and the Wyoming Basin become more pronounced. In Frison's (1991:104) recent overview of High Plains prehistory, his map indicating the various type sites of the Late Archaic leaves southwest Wyoming empty. Three horizon markers of the Late Archaic are discussed: Pelican Lake projectile points from Saskatchewan, Yonkee points from southeastern Montana, and Besant, a highly specialized bison hunting manifestation using well constructed corrals and evidence of extensive religious activity. The Besant material was recovered from the upper levels of the Mortlach site in Saskatchewan, the same site that defined Pelican Lake points in its lowermost levels (Frison 1991). All of these tool assemblages reflect a heavy reliance on communal bison kills using arroyo traps, jumps, or, in the case of Besant sites such as Ruby and Muddy Creeks, log corrals with deep set post holes (Frison 1991:105). Although these three tool assemblages suggest southward movement of either peoples or technology no research has yet to address the implications of their distribution.

The differentiation between the Late Archaic cultural groups of the Wyoming Basin and Northern Wyoming is most clear when comparing the projectile point typologies derived from the Northern Plains. "While Pelican Lake, Yonkee, and Besant appear to have strong northern affiliations, other Late Plains Archaic materials appear to have strong roots in the Great Basin" (Frison 1991:111). Points reminiscent of the Elko series occur as surface finds with some frequency in the Wyoming Basin. Others have attempted to link the Basin to the Northern Plains by creating new diagnostic point types (Kullen and Laurent 1986:11).

Based on the available evidence it seems the Late Archaic of southwestern Wyoming exhibited a broader range of hunting and gathering activities in the region. There is little evidence of communal bison hunting during this period suggesting a decreased reliance on large herd animals as a major resource. Although bison are found in small numbers fauna remains of other species are found in great, more significant numbers. Mountain sheep, deer, and antelope have all been recovered from

Deadman Wash (Mackey 1982:47). Material from Component 7 of Deadman Wash serves as the archetype of the phase proposed by Metcalf (1987) as part of the chronology applicable to the Wyoming Basin (see Figure 4.1). Large, medium, and small mammal bones are found at Cow Hollow Creek as well (Schock *et al.* 1982:111). Frison (1991) admits he cannot decide whether groups in this region were permanent residents or groups engaged in a seasonal round of procurement activities oriented toward plant gathering and small game hunting. Pit houses of this age have also been recorded in the Wyoming Basin.

Late Prehistoric 1500-300 B.P.

Toward the close of the Late Plains Archaic Period and through the Late Prehistoric Period animal procurement increased in relative importance. The climate ameliorated once more as precipitation increased and plant processing continued as a significant part of subsistence. Evidence of increased hunting activity at about A.D. 500 coincides with the densest concentration of radiocarbon dates from southwestern Wyoming (Mackey *et al.* 1982).

Three erosional episodes have been identified at Deadman Wash in the past millennium. A channel entrenchment during the 13th century A.D. marked the first episode. A minor erosional cycle occurred in the 16th century. The current xeric climatic regime is characterized by impressive channel entrenchment which began about A.D. 1870 and continues with general soil erosion in the valley floor of Deadman Wash (Mackey *et al.* 1982:33).

In some respects, the transition between the Late Archaic and the Late Prehistoric is arbitrary since it is a continuation of Archaic adaptations. Though a limited sort of horticulture was being practiced by Fremont groups in the Great Basin in eastern Utah and the Northern Colorado Plateau (Kelly 1985:308, Jennings 1978) and by Plains Woodland peoples to the east (Wedel 1961), there is no evidence of horticulture in Wyoming (Frison 1978). The accelerated mining and well drilling activities of both gas and oil, beginning in the 1970s in western Wyoming has led to a dramatic increase in recorded sites and radiocarbon dates. This increased number of radiocarbon dates for the Late Prehistoric period has been interpreted as a rapid expansion in the prehistoric population, particularly in the intermontane basins (Frison 1991:111, Metcalf 1987:247, Mackey *et al.* 1982:45). The drop in radiocarbon dates at ca. 1000 B.P. is unexplained. Metcalf termed this period the Firehole Phase and, other than using the reduction in the number of radiocarbon dates to infer a corresponding reduction in population size, offers no other explanation for the abrupt shift in frequencies. However, evidence at the Deadman Wash site revealed a short, sharp xeric climatic episode that caused an erosional cycle. As in the past, this xeric episode reduced the carrying capacity of southwest Wyoming at approximately A.D. 1300 (Mackey 1982:63). Although there is a three-century gap between these temporal estimates, there may be enough latitude in the approximation to allow a correlation between these two events.

The introduction of the bow and arrow, evidenced by a diminution of projectile point size with the introduction of Great Basin style points such as Rose Spring corner-notched, also demarcates the boundary between the Late Archaic and the Late Prehistoric (Schock *et al.* 1982, Laurent 1983). The latter period lasted until approximately 300 years ago with the arrival of European trade goods. Because they are associated with the introduction of the bow and arrow, Rose Spring projectile points have a wide spatial distribution and short temporal distribution which makes them ideal diagnostic horizon markers (Laurent 1983:57). Metcalf (1987) divides the Late Prehistoric Period into two phases: the Uinta which lasted until about A. D. 950 and the Firehole Phase, which lasted until the beginning of the Proto-historic Period (see Figure 4.1). In general there is an increased diversity in projectile point types during this time throughout the region.

Although projectile points such as Desert Side-notched and Rose Spring spread outward from the Great Basin other side-notched point types grouped under the label of Avonlea extended southward from Saskatchewan. In Canada, they are true side-notched points but there is considerable variation in the placement of the notches the further south they are found. One site, the Wardell bison trap, is an associated processing area located in the Upper Green River Basin. In his original report, Frison (1973) does not identify the recovered points, but he later refers to the point assemblage as "apparently related to Avonlea" (1991:113). He also points out when these groups, accomplished hunters in the north, "moved south into the intermontane basins, they were forced ecologically to become more hunting and gathering oriented" (1991:113). Some sites of this period, including Wardell, have ceramics.

Several ceramic traditions are evident in the Wyoming Basin, although none are well represented. The earliest examples are various finds of Fremont ware in the Green River Basin. Sharrock (1966:111) reported surface finds in Sweetwater County, Day and Dibble (1963:15) recorded 39 sherds from a single site in Flaming Gorge Reservoir, and, most recently, three localities in extreme southwest Wyoming yielded Uinta Grey Ware, dated between 650 A.D. and 950 A.D. (Hakiel *et al.* 1984). This better-made Unita pottery, along with a smattering of Southwestern Puebloan ware, gives way to Intermountain Tradition Ware also referred to as "Shoshonean." Wright (1978:121) posits that this latter ceramic style reached southwest Wyoming during the 15th century from southern Idaho. Frison believes it to be the only ceramic tradition indigenous to the High Plains.

Though it is not clear which came first, carved steatite vessels in the same flower pot style of Intermountain Tradition pottery are commonly found throughout Wyoming. Increased frequencies of finds are located in the Green River Basin and regions of northwest Wyoming. Frison (1991:116) discusses numerous sources of steatite found in pre-Cambrian deposits in the mountain ranges of the state, all of which reveal evidence of prehistoric quarrying. Roughly carved blanks have been found in caches at varying distances from quarries (Frison 1982). Unfortunately, steatite vessels have not been recovered in datable contexts.

From a broad perspective, examining the archaeological record for the Late Prehistoric Period indicates a subtle shift in hunting and gathering activities in southwest Wyoming. Faunal analyses of the upper levels of Deadman Wash document the considerable role played by hunting in the subsistence strategies. The upper 50 cm of fill yielded an estimated 31 animals. The last 500 years of occupation of Deadman Wash stressed medium-sized animals, although a number of bison were identified in the faunal assemblage (Mackey 1982:44).

The Wardell bison trap, located in the upper Green River Basin, is the only recorded communal bison kill site during the Late Prehistoric Period in the region. Communal antelope procurement seems to become prominent as well as a widening of the subsistence base as reflected by a variety of recovered faunal remains from numerous sites (Tucker 1985:322, Harrell 1989:2.11). This trend of communal hunting continues into the historic period. Recovery of a large population of herd animals such as bison or antelope killed simultaneously and a subsequent analysis of tooth eruption patterns allows for a determination of the season in which the animals were killed (Frison 1978:290). This information provides a clear picture of the seasonal rounds of the prehistoric occupants. Evidence from a number of sites, such as the Wardell site in the Green River Basin, suggests that large scale bison drives over jumps were conducted in the early fall (Frison 1978:228). Frison (1978, 1991) argues that a greater reliance on communal hunting swept the region with the introduction of the bow and arrow.

An increase in the number of ground stone tools and the occurrence of charred seed remains recovered from floated fill of storage or fire pits reflect a substantial increase in the importance of gathered plant foods during the Late Prehistoric period. Recently, Smith (1988) compiled the results of analysis of 152 hearths and pit features from eight prehistoric sites from southwest Wyoming in an effort to clarify the importance of seed foods in the subsistence of the inhabitants of the region. The results were startling. Of the 67 features dated to the Early Archaic, only 11 (16%)

contained charred seeds. Only two (9%) of 21 Middle Archaic features yielded a total of three charred seeds. For the Late Archaic, four (20%) of the 20 examined features had charred seeds. Finally, in contrast to the Archaic Period feature, 94 (77%) of the 122 Late Prehistoric features produced seed remains. In some of the features, goosefoot (*Chenopodium* spp) comprised upwards of 75% of the tens of thousands of recovered seeds. It is the most frequently encountered seed recovered from feature or hearth fill.

> Though the sample of Archaic period features with charred seeds will most likely increase with further research there appears to have been a dramatic change to a greater reliance on seed foods by the people of the Late Prehistoric period (Smith 1988:151).

Before addressing the region's proto-historic period, a brief note should be made of the perishable items recovered from many caves and rockshelters in northwest Wyoming. While none of the rockshelters are located in southwest Wyoming, the artifacts found in them point strongly to Great Basin influence, particularly during the latter portion of the Late Archaic. Coiled basketry fragments found in several caves in the Bighorn Mountains argue for a Great Basin hunting and gathering subsistence strategy (Frison 1962,1965).

Atlatl fragments, Atlatl weights, and broken and complete wooden foreshafts have been recovered from some of the same caves (Frison 1962,1965). Woodworking debris, cordage, sinew, hide, shell, and even feathers have been preserved in the dry mountain caves. One cave yielded a projectile point mounted with sinew and pitch to a wooden foreshaft. Fragments from different caves identical to Fremont style parching trays demonstrate a close similarity to Great Basin coiled basketry (Frison 1991:107). Based on ethnographic analogy, a substantial fragment of a large mesh net dated to the Late Prehistoric is thought to have been used in hunting mountain sheep (Frison 1991:107).

Proto-historic and Ethnohistoric 300 B.P. - Present

Small amounts of European trade goods are found from time to time in southwestern Wyoming, particularly as burial items. Early glass beads, horse bones, and iron fragments have been found along with small side-notched and tri-notched projectile points along the North Platte River (Frison 1991:123). Although European trade goods initially had minimal effect on the region's inhabitants, it has long been recognized that the introduction of the horse brought significant change (Wissler 1914).

Iron and brass in the form of knives, lance points, projectile points, and bells are occasionally found (Frison 1978: 73-74). Many of these lance and arrow points appear to have been hammered with stone then smoothed and sharpened on hard sandstone abraders. Frison (1978,1991) reported that many such arrow tips and knives were common finds at the turn of the century but that they are fast disappearing as they rust away.

A number of North American Indian cultures can be identified with the Wyoming area, the Crow in the Yellowstone Basin, the Teton Dakota to the east and south, and the Arapaho and Cheyenne around the Black Hills and southward through eastern Wyoming (Wedel 1961:241). However , the Northern Shoshone from the Wind River region of Wyoming, the Lemhi River Shoshone, and the Sheep-eater Shoshone (*Tukudeka*) who historically inhabited the mountains and high valleys of southeastern Idaho and northwestern Wyoming will be discussed to illustrate the subsistence and settlement patterns utilized in this region of the northern

Great Basin and High Plains. Linguistically, the Shoshone of southern Idaho have been shown not to be far removed from other Shoshonean groups inhabiting other portions of the Great Basin (Jorgensen 1980). Steward (1938), without benefit of empirical testing of their language, identified the linguistic similarity of various Shoshonean groups 40 years before.

The earliest record of European contact with the Shoshone occurred in 1730 when French traders observed a battle between Blackfeet and Shoshone in southern Saskatchewan. The French had recently given the Blackfeet firearms in trade and they used them with devastating effect on the Shoshone. The Shoshone fled to the south and seemed to have moved into Wyoming and Idaho (Trenholm and Carley 1964). Lewis and Clark were the first Americans to meet Shoshonean groups in Montana and Idaho in 1806 (Biddle 1962). Shortly afterwards the Northern Shoshone came into ever increasing contact with American trappers and traders. For the most part this contact was friendly until the influx of European immigrants in the 1850s and 60s. The Wind River Shoshone, under the leadership of Chief Washakie, remained peaceful throughout the Western Frontier Period. Hostilities did occur between the Lemhi Shoshone and Euroamericans for a time. After the Lemhi were placed on the Ft. Hall Reservation in 1868 warfare decreased, although the struggle did not cease until 1878 (Steward 1938:8).

In 1847 Jim Bridger counted a population of 4,000 Indians at Ft. Hall including 500 Bannock who were living with the Shoshone at the time (Trenholm and Carley 1964). There are no available estimates for the Wind River Shoshone or for the Sheep-eater Shoshone. This latter group lived in small family units that avoided contact with whites although they did live among both the Lemhi and Wind River Shoshone at different times.

During the period of initial contact (1806-1840) between Shoshone and Euroamericans, significant change took place regarding social organization and subsistence. The most significant change was the introduction of the horse and the adoption of many Plains Indian traits by the Wind River Shoshone. Acquisition of the horse seems to have led to aggregation of groups into larger social units (Hultkrantz 1974). Using the horse, the Lemhi Shoshone hunted the bison of southern Idaho intensively until they were completely wiped out by 1840. The Wind River Shoshone began seasonal bison hunting in the spring and fall. They moved each year out of the Wind River region of northern Wyoming to hunt on the High Plains of southern and southeastern Wyoming, although they had to be continually alert for attacks by the Crow and Arapaho who were their traditional enemies (Shimkin 1947a). The Ute of northern Colorado apparently traveled to southwestern Wyoming to hunt as well, though they were on friendlier terms with the Shoshone. Their oral histories recount details of conflict with the Arapaho in northern Colorado and Wyoming (Smith 1974:249).

It seems that the relatively late incorporation of Plains hunting strategies caused a major change in the social organization regarding the sexual division of labor. The Shoshonean groups of the Great Basin possessed an egalitarian society, with women taking part in the organized rabbit and antelope drives and the men aiding in the gathering activities alongside the women and children (Steward 1938:44). This was particularly true of the annual pinion nut harvest in the fall. Introduction of the horse and the change to organized bison hunting among the Wind River Shoshone seems to have altered the sexual division of labor. It became more clearly demarcated, with the women relegated to a lesser role in the society. Further, the Wind River Shoshone adopted the concept of warrior societies that had some power in regulating hunting activities and policing the camps.

Ethnographically, the study of the Northern Shoshone began with a brief visit by Robert Lowie to the Wind River and Ft. Hall Reservations in 1907 (Lowie 1909,1924). Steward (1938, 1939) is, of course, best known for his work among the Shoshone, but he concentrated primarily on groups found in the Great Basin and secondarily to the Northern Shoshone. Shimkin (1947a, 1947b) visited the Wind River Reservation in the 1940s, and the most recent publications record the work of Hultkrantz, a Swedish anthropologist, who lived on the same reservation in the early 1950s. Published in Sweden, only a portion of his work was translated into English (1974).

For this study, the historical records of the mobility of the Shoshone is of particular importance. Evidence indicates the Lemhi Shoshone made their winter camp at the Lemhi River on the Camas Prairie at the present location of Ft. Hall in southern Idaho. This area served as a pre-contact trading center that the Bannock, Nez Perce, Flathead, and Wind River Shoshone frequently visited. This movement of people back and forth between Idaho, Wyoming, and Montana seems to have occurred frequently and over a long period of time prehistorically (Biddle 1962). Steward (1938:192) mentions the Shoshone who wintered in Wyoming as sometimes visiting Camas Prairie. The European traders who came later simply took advantage of this earlier trading center to gain contact to trade with the different tribes occupying the Rocky Mountains, Great Basin, and Columbian Plateau. A major trade item between the various tribes was the dried salmon that the Lemhi Shoshone fished for each October. There are also indications of family groups changing affiliation from one band to another during the historic period. This was probably true during the prehistoric period as well. Undoubtedly, this trading center served as a means of information exchange too.

Steward (1938) discusses the historical documentation for this region at some length to illustrate that the Shoshone moved freely between the Great Basin and the High Plains to the east, in some instances traveling upwards of 1,200 miles to the headwaters of the Missouri and Yellowstone Rivers. Wright (1978), in presenting a case for the original migration of the Shoshone into the region around A. D. 1000 utilizes archaeological data to illustrate much the same movement from the Great Basin to Idaho and Wyoming prehistorically. He traces the spread of ceramics styles (Intermountain Ware) associated with the Numic speakers into the Green River Basin, Bridger Basin, and the Red Desert region of south-central Wyoming.

The Shoshone utilized a broad-based economy of hunting, fishing, and gathering. The Lemhi Shoshone, prior to the acquisition of the horse, "lived on wild grasses, fruits, pinion nuts, fish (salmon and trout) and antelope, deer and sheep" (Hultkrantz 1974:187). Two important plant species were the "yampa" (*Atemia gairdneri*) and "camas" (*Camassia sp*), both tubers that the Lemhi dried, placed in bark bags and stored in underground caches for winter use (Hyde 1959:57). Steward also refers to these plants as being especially abundant on the Camas Prairie (1938). He records that the Lemhi utilized a total of 13 varieties of seeds, 20 types of roots, three types of berries and two kinds of greens (Steward 1938:19). Shoshonean groups in the Great Basin utilized an even larger number of plant species. Lowie (1909:173), as part of the trait list established during his brief sojourn among the Northern Shoshone, noted that they used every piece of obsidian they could acquire as long as it possessed a sharp, cutting edge.

Young boys hunted groundhogs, rabbits, prairie dogs, and sage hens (Lowie 1909). Antelope drives, mentioned earlier, were sometimes organized that included both men and women. An important aid to hunting was the use of trained dogs that both the Lemhi and Sheep-eater Shoshone are reported to have used in hunting deer and sheep (Biddle 1962). Humfreeville (1899), a soldier on the Western frontier for two decades, reported that the Shoshone used scoop nets and spears to catch fish and frogs. He also claimed they ate large numbers of insects, including grasshoppers and crickets. This reference to insects is repeated in a number of other historic accounts (Steward 1938). Archaeological evidence of insects (Mormon crickets) used as food has also been recovered from at least one cave site in western Wyoming (Frison 1991).

Sharpened sticks were used to gather roots, and various baskets were used to collect and store various seeds and nuts (Hultkrantz 1974). An important grass, Indian rice grass (*Oryzopis hymenoides*), was collected in the early summer before other plant foods became available (Steward 1938).

Of course the Wind River Shoshone of the historic period relied heavily on seasonal bison hunts in the early fall where they dried large amounts of meat to supply them during the winter. They probably had a more generalized subsistence base before they obtained the horse.

Except for the horse-mounted Wind River Shoshone, there is no evidence of any Shoshonean group operating under a permanent leader. Leadership by a headman was temporary. An individual was selected to organize and direct seasonal fishing among the Lemhi, but this leadership changed from year to year. The same was true for organizing rabbit and antelope drives. An individual was selected to direct these activities, but he lost his authority as soon as the drive was completed. The Wind River Shoshone were led by one man, Chief Washakie, from 1840 until his death in 1900. Because of their dependence on annual organized bison hunting and frequent warfare against the Crow and Arapaho, they exhibited the greatest amount of continuity in their leadership, but individuals or families could come and go as they pleased which they did often. Those leaders who did serve as spokesmen for their bands did so through the force of their personalities, and because of their ability to arbitrate disputes to everyone's satisfaction and to direct activities through verbal persuasion.

Movement of greater and greater numbers of Euro-Americans through Wyoming along the Oregon and Overland Trails, beginning in the late 1840s, spelled the end for the Shoshone way of life. Chief Washakie, recognizing the futility of resistance early, maintained peaceful relations with the United States government in Washington throughout the settling of the West. His people were given the Wind River region of Wyoming as their reservation, which still exists today.

Chapter V

Methods

The accumulated Wamsutter survey reports encompass a total of 45,600 acres (184.5 square kilometers). The goal was to obtain an intensive, statistically meaningful survey which could provide an initial impression of the settlement/ subsistence patterns as they existed in this region as well as provide an inventory of prehistoric cultural resources. Assessing the significance of these resources for the region constituted the final portion of each report. The Bureau of Land Management, based upon recommendations of the contract archaeologists and concurrence by the State Historic Preservation Office, decided upon each course of future action: avoidance, testing, or excavation to mitigate the effects of the energy developers. These surveys were performed on individual sections (640 acres) and a separate report issued for each square mile. The results of previous area surveys were incorporated into the body of each applicable report if possible.

In 1981 two separate proposed pipeline routes (Sender *et al.* 1982, Mackey *et al.* 1982) which traversed the project area were surveyed and tested, providing further evidence from the region. Only those portions of the above reports dealing with the original regional survey were incorporated into the current research. In both projects geomorphologists provided much needed information regarding the paleoclimatic conditions existing in the basins since the end of the Pleistocene. Of particular interest was evidence of the Altithermal, a long xeric period first postulated by Antevs (1948, 1955) and subsequently used to explain a cultural hiatus in the northern plains (Reeves 1973). Although geological and paleo-environmental evidence has further refined the extent and intensity of the Altithermal, archaeological evidence has continued to chip away at the idea that portions of the High Plains were abandoned during portions of the Altithermal (Reeves 1973). However, more recent data suggests that the Altithermal may have been more regional in scope than heretofore recognized. Davis and Sellers, in analyzing multifaceted paleoclimatic data (i.e. pollen, macrofossils, mammoth dung from Bechan Cave in southern Utah), conclude that

> "it appears that the Pacific Northwest was driest in the early Holocene (*before* the Altithermal), and at the same time the Southwest was wetter than later periods. We conclude that the timing of the classical climatic sequence was wrong, and that no single climatic sequence can be applied throughout western North America (1994:110)"

Survey Methods

Although the number and composition of the survey crews varied during the 1979 and 1980 field seasons, the methods used to examine the region remained uniform. Crew members walked multiple transects spaced approximately 10 meters apart. All areas received adequate coverage but with special attention given to dunes, arroyos, animal burrows, erosional gullies, and anthills which might yield a higher site potential. Maps of well pad access roads supplied by the contractor aided the survey efforts. Recently placed Brass cap datum markers of the U.S. Geodetic Survey insured accurate locations for recorded sites. Relatively speaking, ground cover for the survey region was sparse with only occasional dense patches of sagebrush to impede a survey member. In addition to the lithic debitage and debris found in the course of surveying the region it was not uncommon to

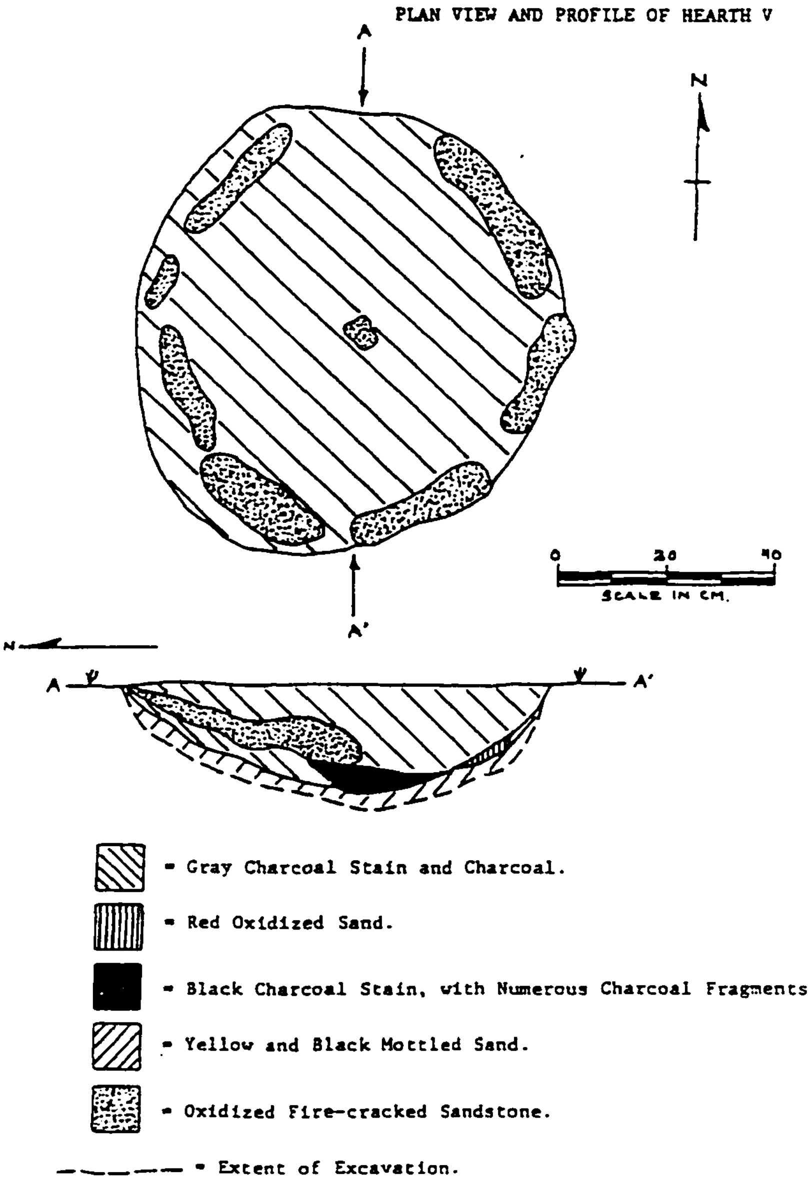


Figure 5.1. Typical stone lined hearth
Hearth V, 48CR3405 (reprinted from Schoen 1981a)

come upon the stained outline of hearths exposed on the ground surface. Figure 5.1 illustrates the common characteristics of stone lined hearths recorded during the Wamsutter survey. Slabs of sandstone are placed along the sides of the small pits to prevent sand or loose soil from filling back into the pit. Although hundreds of such hearths were recorded, only a few were exposed by road or ditch construction. The remainder were discovered exposed on the ground surface, in many cases no more than a charcoal flecked stain readily identifiable as a hearth.

Optimally, any archaeological survey seeks to record all archaeological sites, large and small. Such an endeavor, regardless of research design or sampling strategy, never succeeds perfectly. I make no apologies for the nature of the sampling conducted during the course of the surveys reported here. One hundred percent of the region was traversed and, though the survey was not random, patterning of sites in terms of topographic and ecological features is demonstrated.

Wamsutter Block Area Survey Results

A total of 911 sites were recorded during the Wamsutter area survey, an average of five sites per square kilometer. These sites contain 1,045 archaeological components (Figure 5.2). For purposes of the Wamsutter survey, a site was defined as at least two pieces of culturally modified material found within 3 meters of each other. In one case, a site was defined on the basis of a single feature, a surface hearth stain without any lithic debitage present. Although isolates were recorded in the original survey, only diagnostic projectile points are used here to measure variation in frequency of lithic material utilization through time. Such variability in lithic frequencies in projectile points was also measured in multi-component sites, where

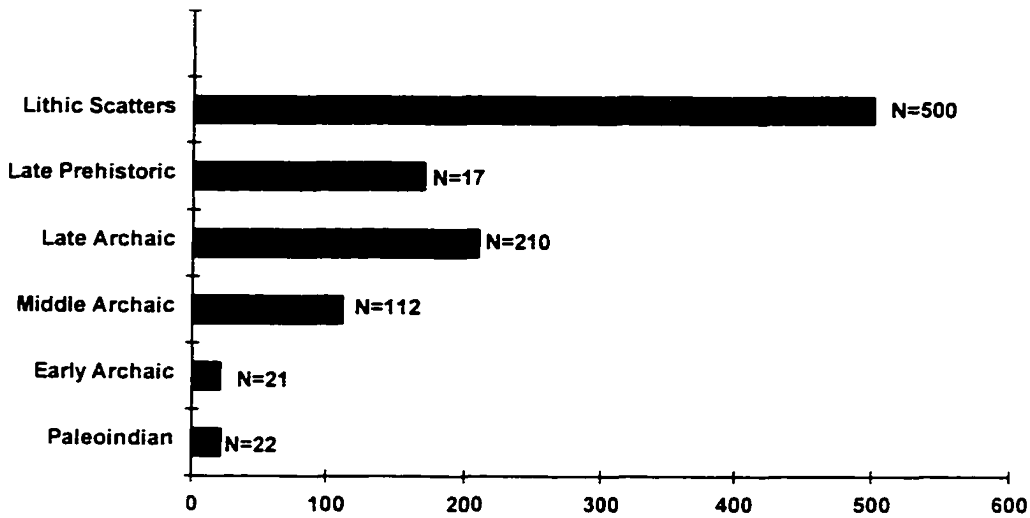


Figure 5.2. Wamsutter Prehistoric Components

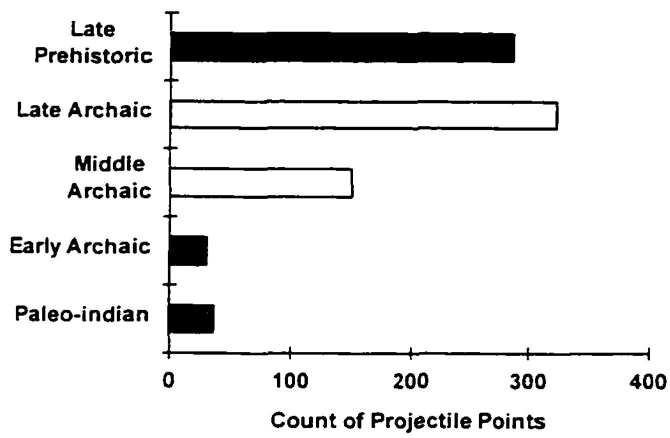


Figure 5.3. Prehistoric Components by Point Count
The comparative count of identified projectile points reflects the similar numbers of identified sites in the Wamsutter project.

Table 5.1. Summary of Topographic Site Locations

	Basin	Dunes	Fldplain	Terrace	Slopes	Playa	Ridgetop	Bench
Middle Archaic	4	18	8	8	20	8	40	6
Late Archaic	5	36	15	11	52	11	68	12
Late Prehistoric	12	34	11	16	38	5	45	9
TOTAL	21	88	35	35	110	24	153	27

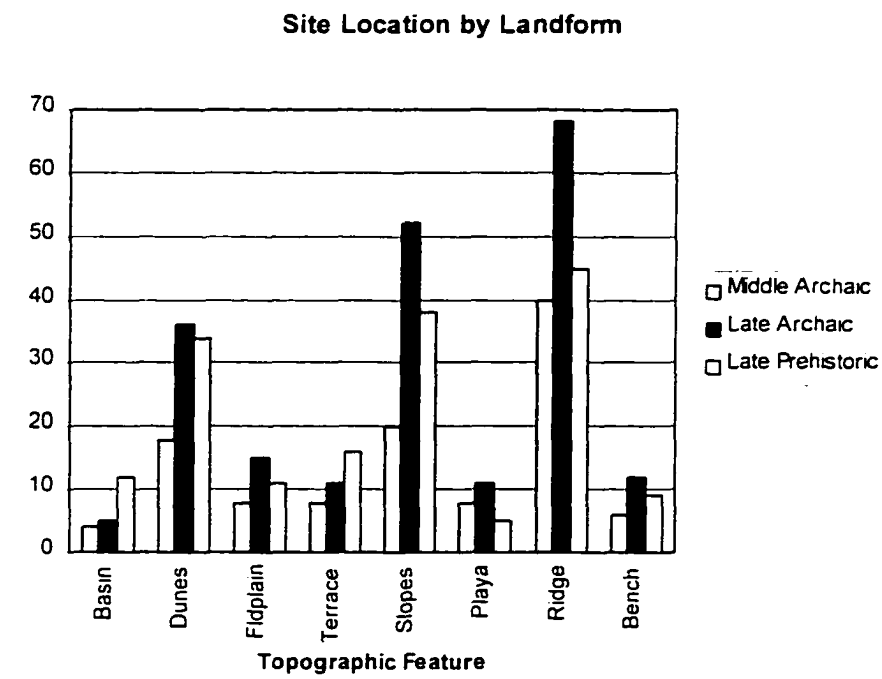


Figure 5.4. Histogram of Site Location by Landform

thousands of years of cultural material lay intermixed on the surface (Figure 5.3). As each section was completed, the field location forms were forwarded to the State Historic Preservation Office (SHPO) in Laramie. There, each site was plotted against the master file to determine if the site had previously been recorded. If not, it was assigned a new site number. It was not uncommon to clump sites under the same site number because of possible confusion as to location or proximity to other sites. For example, site 48CR1583 covers more than 320 acres under a single site designation. Both scattered and clustered hearths, lithic debris, and stone circles lay in contiguous proximity across a broad south facing slope overlooking a series of playas. It was impossible to distinguish different occupations of this huge commingled lithic scatter. Because the diagnostic material recorded under that designation spanned a number of cultural periods, it was not used in subsequent analysis other than the aforementioned diagnostic projectile points.

The varied topography of the Wamsutter area is demonstrated by the site location histogram illustrated in Figure 5.4. More than 20 percent of the sites (N=911) are situated on dunes, a common geomorphic phenomenon in southwest Wyoming (P. Miller 1981, Tucker 1985:306), the Great Basin (Holmer and Singer 1983:36), and even the Southwest where the highest diversity sites are found on aeolian sand deposits in a region of northern Arizona (Irwin-Williams et al. 1988:44). A major portion of sites recorded in Wamsutter are located along ridges and upper slopes (Table 5.1), though this may be partly due to colluviation burying sites on lower terraces and benches. A pairwise comparison of the topographic distribution of sites through time failed to reveal a significant difference between localities although the difference between Middle Archaic and Late Archaic locations approached significant at the .05 level (Middle Archaic/Late Archaic F=3.7475, P(F<=f) 0.0512, df=7; Late Archaic/Late Prehistoric. F=2.2857, P(F<=f) 0.1488, df=7).

A preliminary examination of the data in regard to site aspect was expected to reveal results similar to other regional studies. Grady (1980) demonstrated a statistically significant preference for habitations on specific slope aspects for two portions of the Piceance Basin in northwest Colorado. Site aspects were determined by polar coordinates in 10° increments for sites in the Naval Oil Shale Reserve (N=61) and in the Duck Creek region (N=78). The Null Hypothesis of normal distribution of site aspects for both surveyed areas was rejected at the .01 level of significance, the Naval Oil Shale Reserve yielded $X^2 = 450.8$, degree of freedom = 35, the Duck Creek region yielded $X^2 = 79.5$, degree of freedom = 35 (Grady 1980:169). A marked preference for north facing slopes was noted in the Naval Oil Shale Reserve region with a secondary in east-south-east facing slopes. This preference was believed to be seasonal when Grady suggested that "Slope selection seems to favor the cooler slopes [summer ranges] (1980:170).

Sites in the Duck Creek survey area displayed a complete avoidance of southwest and west facing slopes. Although these slopes should be the warmest slopes during the winter months, they were exposed to the harshest seasonal storms. For this reason, Grady believed that the protected leeside of hills was the preferred site location.

When a similar tabulation of site aspects were performed on the Wamsutter data, the largest number of sites were discovered to lie on western slopes (Figure 5.5). This was at such odds with Grady's Colorado findings that a recheck of site reports against topographic maps was performed for a number Wamsutter sites to determine if errors had been made in the field, but none were discovered.

The consistent west winds of the Wamsutter region provides a possible explanation. The Wamsutter region, as pointed out above, is subject to winds that, while they may ebb and flow in ferocity throughout the day or seasons, rarely fluctuate in direction. The prevailing west winds sweep the dry sandy soil off windward slopes more readily, exposing evidence of prehistoric occupation on Windward (western) slopes while, at the same time, covering evidence on the lee (eastern) slopes. Others have commented on this regional occurrence as well (Tucker 1985:317).

Examination of site distribution by density (total debitage count/area) more closely corresponds to the findings of others. Sites with the greatest density were found on south facing slopes selected for optimal warmth and protection from the persistent winds, evidence of more intense utilization or longer term occupations. Although deflated sites on west facing slopes occur in greater numbers, those sites with more densely distributed debitage occur on southern slopes. This contrast deserves a closer examination. When sites containing hearths are singled out they display site aspects which reflect the role the wind played as a determinate in site selection (Figure 5.6). Frison goes farther, offering a possible explanation for sites possessing stone-lined hearths.

> We should also consider the possibility that these pits were used to heat small structures during cold weather. Many fire pits are situated in areas of south and east exposures. A deep pit with several pounds of hot stones covered over with a thin layer of earth would have warmed the surrounding earth and kept the space inside a small structure warm for several hours (1978:358).

Notwithstanding questions of site destruction through natural processes the presence of stone-lined hearths suggests more permanent habitation that, in turn implies cultural process as opposed to natural process of wind erosion and the intermixing of temporal periods through deflation of unstable dunes The occurrence of large numbers of hearths on west facing slopes is counterintuitive considering the persistence of the Wyoming winds. However, a large portion of sites were located on active dunes.

Sand dunes travel across flat landscapes, like the Wyoming Basin, in a wave-like manner (Bagnold 1941). Sites originally located on the leeward side of a dune could be buried, then emerge from the windward side as the dune traversed the landscape. Site distribution based on the occurrence of hearths reflecting preference in site aspect is readily apparent. Selecting hearths as a locational criteria was an effort to eliminate the more ephemeral sites which, in turn, should reflect more random opportunistic site selection. Anyone who has attempted to build a fire on the Wyoming terrain can attest to the necessity of protection from the wind. An examination of all recorded sites increases the random distribution of sites across the landscape because it incorporates the gamut of behavioral evidence from the most ephemeral single event lithic scatter to long term habitation sites reoccupied through millennia.

Grady (1980), using Chi-square tests, demonstrated statistical significance of site aspects for a portion of the Colorado Plateau. After taking into account the skewed results produced by the persistent west winds in the more arid Wamsutter region, analysis yielded similar results. Chi-square analysis of the site distribution illustrated in Figure 5.6 yielded a Pearson X^2= 255.513, df=8, P<0.0001. Sites exhibit a statistical preference for specific site

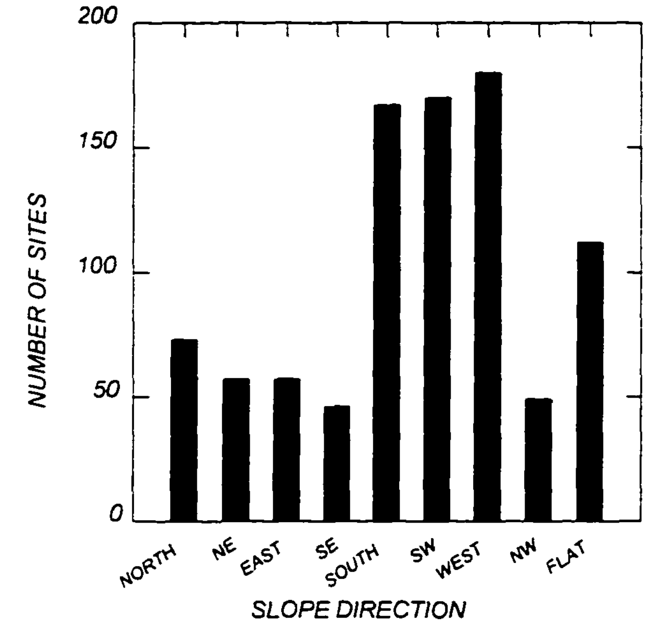


Figure 5.5. Site Aspect Histogram
More than half the sites situated on the southern to western slopes faces.

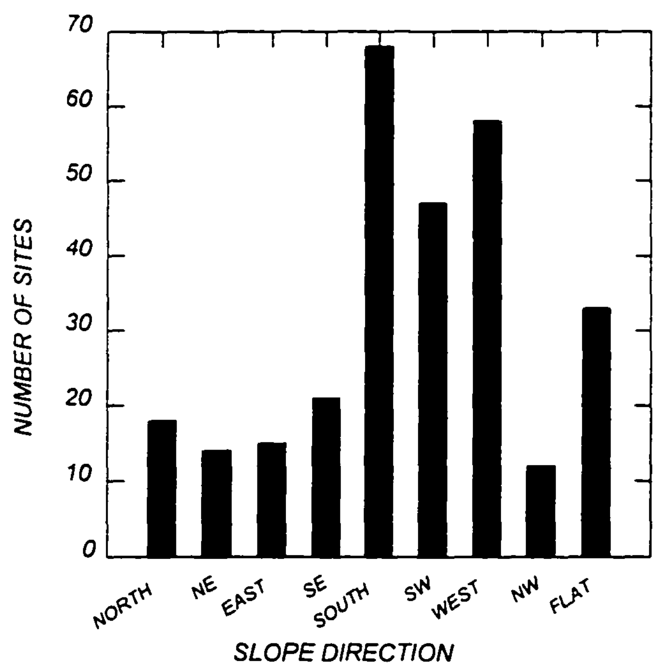


Figure 5.6. Aspect of Sites with Hearths.
The presence of hearths denotes longer term habitations.

locations, taking advantage of landscape features which block the wind and provide maximum sunlight.

Examined synchronically, the ephemeral quality of the majority of sites is easily recognized. Most sites, like those discussed by Frison (1978:13), are small lithic scatters with an occasional diagnostic artifact to allow temporal identification. Individually, they lack explanatory power. However, when combined, redundant patterns of lithic scatters reveal shifts in settlement and subsistence patterns through time as they exhibit cultural response to environmental change. The greatest percentage (545/911, or about 60%) of sites contain less than 5,000 square meters (Figure 5.7).

Further efforts to distinguish the variability of different sites required creation of new variables based on attributes first recorded in the field. The first variable created is size, the total number of identified tools recorded from each site. The second is class, the number of different tool categories. For example, a site with three projectile points and two endscrapers would have a size of five (five total tools) with a class of two (two tool categories). These variables were created in an effort to illustrate the relative diversity of intersite assemblages. Problems of determining site function, diversity, richness, and evenness have been discussed in the previous chapter.

Of the 911 sites recorded in the Wamsutter study 411 (45%) were assigned to one or more cultural periods. Diagnostic artifacts provided the basis in all but one case where a ^{14}C date from an excavated hearth provided a temporal affiliation. Cody Knives assigned two sites to the Late Paleoindian

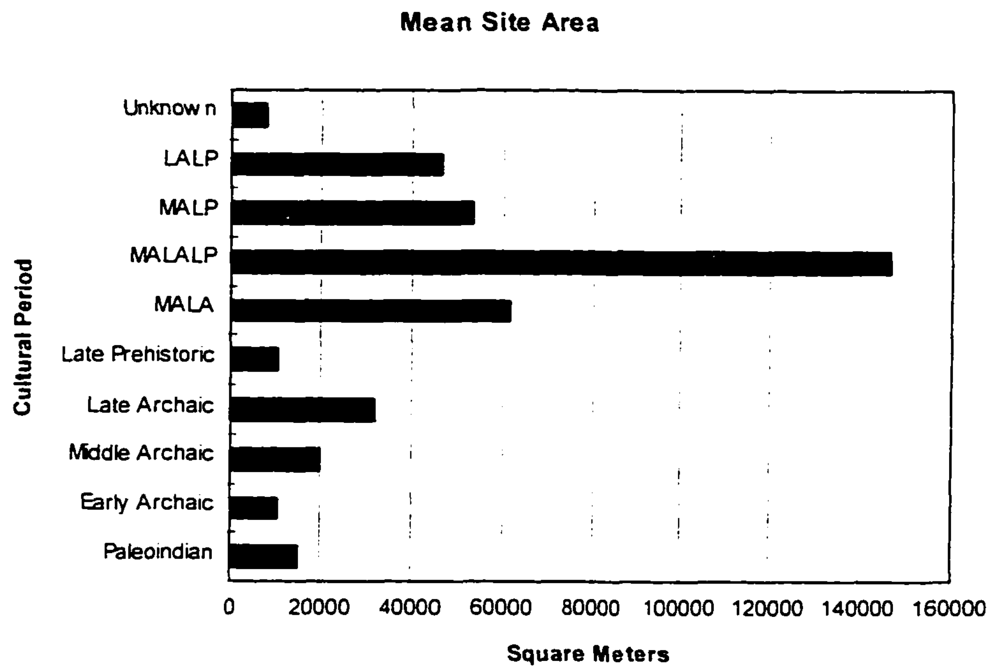


Figure 5.7. Site Area by Cultural Period
MA =Middle Archaic LA = Late Archaic LP = Late Prehistoric. Site 48CR1583 was removed from this tabulation because it was the largest site, incorporating over 320 acres within arbitrarily defined boundaries.

Period. A steatite pipe placed a small lithic scatter, 48SW1948, into the Late Archaic or Late Prehistoric Period. Prehistoric ceramics were recorded on only six sites, assigning them to the Late Prehistoric Period. Historic sites were limited, primarily temporary sheep herder camps introduced since the 1870s. No historic structures, or indication of their prior existence, were discovered through literature searches for the region. In the course of the original survey, the diagnostic contents of historic sites such as broken tools, crockery, and even cast off clothing was listed in survey reports, but will not be a part of this study.

It is important to note the Wamsutter region experienced intensive surface collecting since the Great Depression era of the 1930s (Frison 1978, 1991). Severe drought during that period destroyed vast areas of ground cover, exposing the region to severe wind erosion heretofore unknown, at least historically. Such collecting has not been avocational archaeology, rather it has been rock hounds searching for North American jade and agates found in abundance in the region for years. In searching for these rare rock collector's items, "arrowheads" and other prehistoric items of interest were removed. Rock shops in nearby Rawlins, Wyoming abound with displays of prehistoric and historic artifacts gleaned from the surrounding terrain. When questioned, the local inhabitants either could not recall the location of finds, or they guard the locations carefully as if it were a treasure to be hoarded against future need. Though I have encountered `collectors' many times before, Wamsutter proved an unusual situation since the primary goal of local collectors had not been Native American artifacts but rather collectible gemstone quality rocks with projectile points a secondary source of income. In this case, I feel the region has been even more intensely searched than most areas with prehistoric remains, relative to the population density. How much effect this has had on the prehistoric record, one can hazard only a crude guess, except to say that it has undoubtedly reduced the number of temporally identifiable sites by the removal of diagnostic projectile points.

Identified sites range from the Paleoindian to the Late Prehistoric Shoshonean occupation as evidenced by the few ceramic potsherds recovered. The earliest evidence recovered from the Wamsutter region is a fluted Folsom preform. Other Paleoindian projectile points are of later periods such as Hell Gap, Agate Basin, and other lanceolate types. Types from the Plano Complex are prevalent, especially the asymmetrical hafted Cody knives.

Although the numbers of Paleoindian and Early Archaic sites are too few to allow inclusion in any meaningful analysis of the recorded sites a brief discussion of the finds follows.

Paleoindian Period

As mentioned above, evidence of the earliest occupation in the Wamsutter area is a fluted preform. None could be attributed to the Clovis period, but a single fluted preform similar to Folsom preforms described by Tunnel (1977) was recovered from 48CR1706 (Figure 5.8). Made of brown chert, it had been successfully fluted on one side and snapped in half laterally, probably as a result of a failed attempt to flute the opposite face. Recovered with the Folsom preform was a small lithic scatter consisting of two retouched flakes, two small endscrapers, and a single retouched blade. All artifacts except for one scraper of black quartzite were manufactured from local cherts. No other fluted points were recovered during the Wamsutter survey.

The Paleoindian period in the Wamsutter survey is represented by 22 components, 2% of the recorded sites. As in the majority of sites in the area, a significant portion containing Paleoindian artifacts were found in a mixed context of multi-component sites. In the case of the Paleoindian period, 10 sites are listed as multi-component sites with material of later periods commingled with diagnostic lanceolate points of the Cody Complex or other lanceolate point traditions. A single Paleoindian projectile point found with

Archaic or Late Prehistoric Period materials can be attributed to other possible factors than a multi-component site. Finding a useable earlier tool by later prehistoric inhabitants can also be offered as an explanation for multi-component surface finds. Such cases can be argued in, at least, three instances in the Wamsutter study. The frequency of deflation exposing earlier artifacts on the surface through time cannot be discounted.

By far the greatest number of Paleoindian sites contained diagnostic artifacts indicative of the Late Plano Complex. Four sites contained points similar to Scottsbluff II points. Of the remaining 11 sites only one site (48SW1930) appears to be a Paleoindian base camp or a sequential series of camps, encompassing an area of approximately 60 acres (Figure 5.9). It is, in fact, a site complex in the northern portion of the Wamsutter area containing eight separate loci of Cody Complex materials. The presence of a large number of broken projectile point bases and wide variety of other stone tools such as gravers, diverse types of scrapers, burins, and diagnostic Cody knives convinced the site's discoverer that the site was a Paleoindian base camp (Vlcek 1979d:6). The diversity of tools, beyond those commonly associated with butchering activities, supports Vlcek's initial impression of the site. Two discarded point bases display evidence of modification; one became an endscraper and the other a graver.

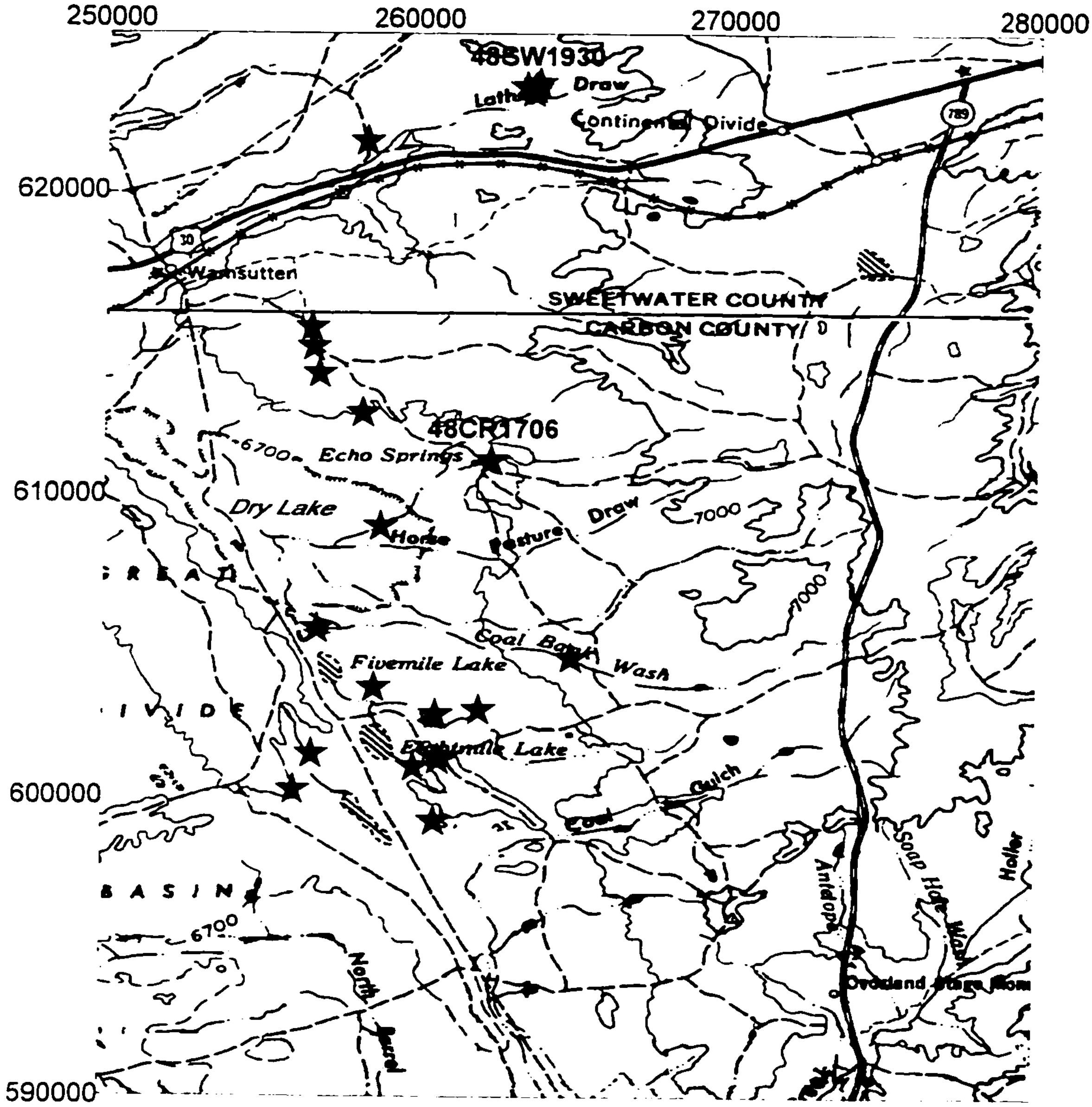


Figure 5.8 Paleoindian Components
Stars designate Paleoindian components. Identified sites are discussed in text.

48SW1930

Eight loci comprise site 48SW1930 on either side of Latham Draw in the northwest corner of Section 11, Township 20 North, Range 93 West (Figure 5.9) Based on the proximity of the different localities and, to some degree, similarity of lithic material and tool types, the different loci were designated a Paleoindian site complex. The various loci appear to concentrate on ridges overlooking Latham Draw from both sides. Latham Draw is currently a broad, shallow intermittent drainage which holds water only after a heavy downpour. Originally recorded as eight separate loci covering nearly 60 acres (Vlcek 1979a), the Wyoming SHPO lumped them together as a site complex. Three loci are located on the north side of Latham Draw (a,b,c), and five on the south side (d,e,f,g,h). Diagnostic Cody Complex material was recovered from five loci. In addition to the singular Cody knives, Scottsbluff and Eden points were interspersed with a variety of scrapers, burins, gravers, and a diverse assortment of multi-edged unifacial tools. The lithic material used in their manufacture is equally diverse. Oolitic cherts from local cobbles predominate, but various colored cherts of unknown origin, quartzite from Black Butte 50 miles to the west, and local porcellanites and chalcedonies were recovered. Moss agate debitage from the Green River Basin 90 miles to the west was also present in significant numbers (Creasman *et al.* 1982).

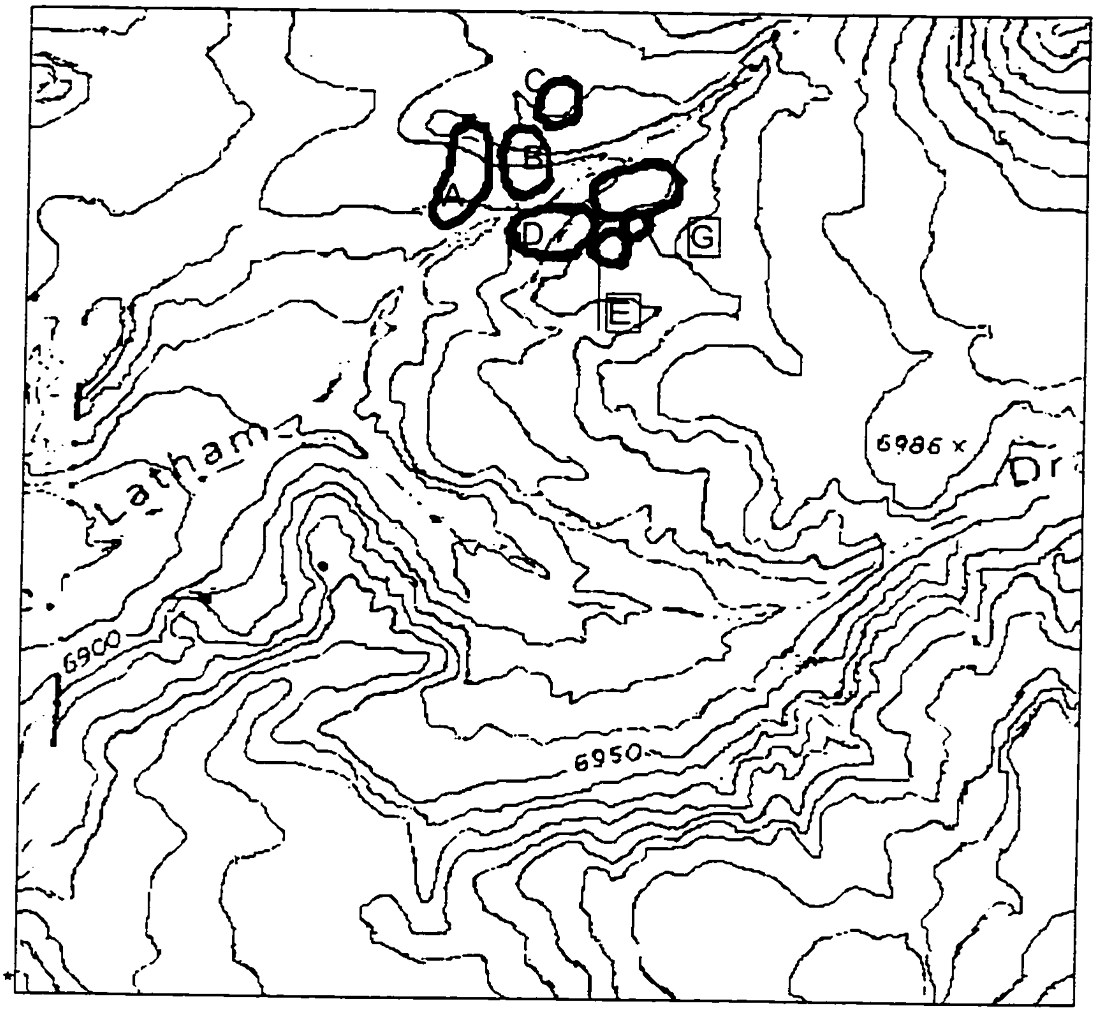


Figure 5.9 Paleoindian Complex, 48SW1930

Late Prehistoric projectile points were recovered from two loci containing Paleoindian components, removing them from further analysis. Three loci lack diagnostic artifacts which could be used to infer cultural periods of occupation . Locus B on the north side of Latham Draw and loci E and F contain diagnostic artifacts reflecting a Cody Complex assemblage without evidence of later occupations. Reexamination of the Horner site assemblage, the type site of the Cody Complex, has called into question the accuracy of recognizing that Eden and Scottsbluff points were contemporaneous. It is now believed these two cultural markers are separated by about 1,000 years (Frison and Todd 1987). Thus, these loci represent locations spaced widely apart in time. The largest locus (F), located on a level plain along the southern edge of the broad streambed cut by the north arm of Latham Draw, contained more than 17 tools. Small stabilized dunes and blowouts are interspersed across the site area. No surface hearths or burn stains were noted, but the potential for buried remains beneath the small dunes cannot be discounted. Vlcek (1979a:6) recorded one complete, as well as four broken, Scottsbluff points from the locus. One of these had been reworked into what appears to be a hafted scraper. The majority of artifacts appear to have been manufactured from locally available lithic materials. The presence of a single scraper of moss agate suggests that raw material from the Rock Springs area to the west may have been imported.

The diversity of tools and the frequency of discarded broken projectile points argue for a wide spectrum of domestic activities at the site, such as the presence of gravers and burins suggests wood and bone working, while other tools and debitage infers lithic tool manufacture and maintenance, butchering, and hide preparation.

Early Archaic

In many respects, the Early Plains Archaic horizon of the Wyoming High Plains is more enigmatic than earlier Paleoindian cultures. Since the recognition of the sudden climatic shift known as the Altithermal occurred (Antevs 1948), arguments have gone back and forth regarding the effects of this xeric climatic episode. It has been suggested that Early Archaic peoples fled to the foothills and high mountains in the region to escape the ecological calamity thought to have decimated the large herds of bison and other ungulates in the mountain basins and High Plains (Benedict and Olson 1978). More recent data, although sparse, tend to suggest that regions such as the Powder River Basin (Shaw 1980) were not entirely abandoned during the Altithermal, but rather a subsistence pattern was developed in response to the more xeric seasonal shifts. Questions have been raised about the existence of a cultural hiatus in the eastern Great Basin at the same time (Aikens 1976). Others, as mentioned in the previous chapter, suggest that the climatic cycles in the early Holocene produced more regional effects than recognized earlier (Davis and Sellers 1994).

The problem of correctly identifying diagnostic Early Archaic projectile points continues to plague the identification of surface sites in the High Plains. Similarity between many Early Archaic and Late Archaic point types has been noted by Frison (1990:88). Although the identification of diagnostic Early Archaic points from the Wamsutter survey encountered similar difficulties, designation of specific point types always erred on the side of caution.

Evidence of Early Archaic occupation of the Wamsutter region was found in 21 sites, half of which yielded single component occupations. Age was assigned through identification of diagnostic projectile point in all but one

Table 5-2. Wamsutter Radiocarbon Dates

Site	Radiocarbon Date	SAMPLE #
48SW1873	1075 ± 75 B.P.	UGa-3772
	1345 ± 95 B.P.	UGa-3774
	1110 ± 75 B.P.	UGa-3787
48CR1583	4450 ± 400 B.P.	
48CR1680	2990 ±90 B.P.	Beta #2503
48SW1900	680±110 B.P.	RL-1491
48CR1211	1820 ± 110 B.P.	
48SW1688	2310 ± 140 B.P.	RL-1497
	2470 ± 140 B.P.	RL-1497
48CR3495	790 ± 60 B.P.	
	1650 ± 120 B.P.	
48CR2722	1550 ± 100 B.P.	Beta #2086
	2990 ±260 B.P.	Beta #2134
	4820 ±130 B.P.	Beta #2087
48CR3405	1260 ±140 B.P.	Beta #2077
	3910 ±150 B.P.	Beta #2504
	5750 ±190 B.P.	Beta #2692
	5560 ±100 B.P.	Beta #2693
48SW1950	1435 ±75 B.P.	UGa-3779
	1225 ±65 B.P.	
	960 ±100 B.P.	RL-1492
48CR1777	3210 ±490 B.P.	

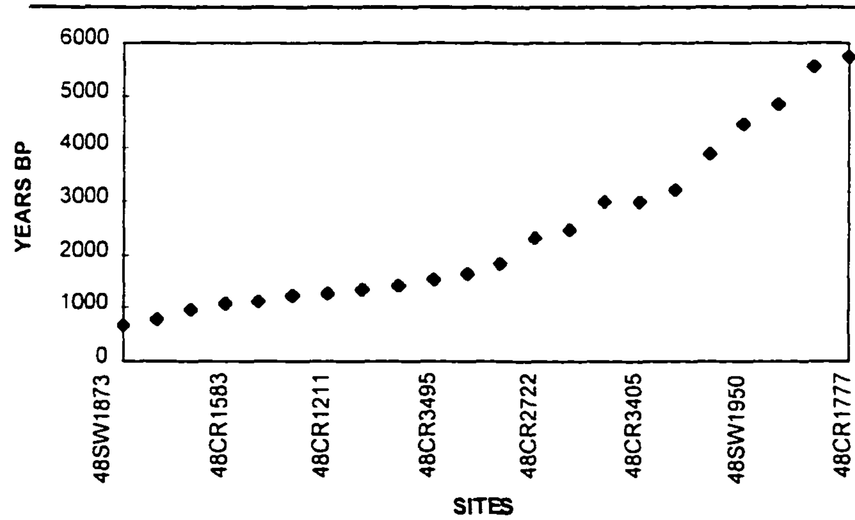


Figure 5.10. Distribution of Wamsutter Radiocarbon Dates

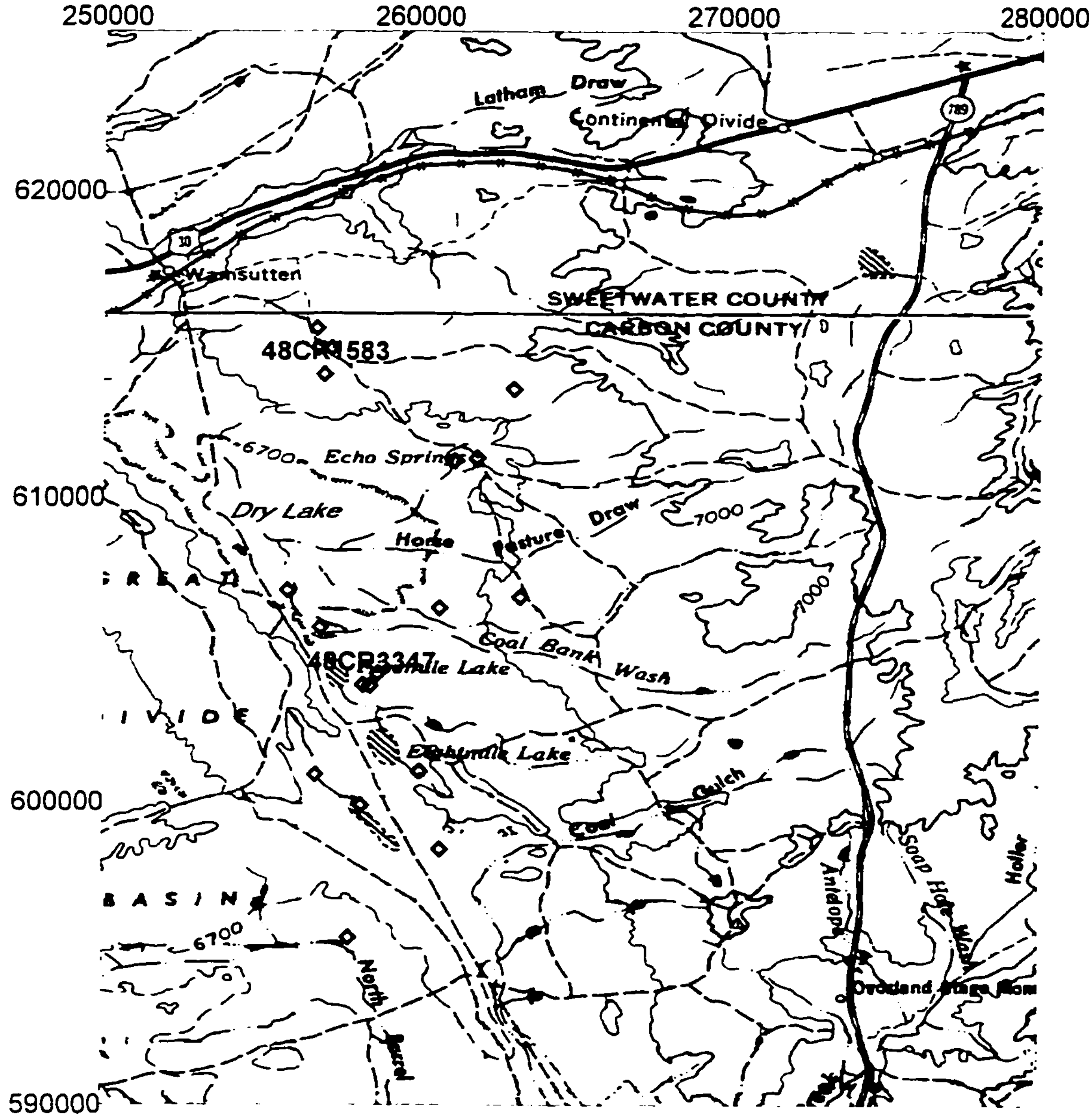


Figure 5.11. Early Archaic Components
Diamonds denote the documented Early Archaic sites. Sites identified are of those discussed in the text.

case. A surface hearth at 48CR2722 yielded a ^{14}C date near the end of the Early Archaic Period, 4820± 130 B.P. (Figure 5.10). Two additional hearths at the site yielded Late Archaic dates, 1550±100 B.P., and 2990±260 B.P. As in the case of Paleoindian sites discussed earlier, it is not altogether unlikely that some, if not all, of these single component sites are the result of unknown site formation processes or errors in survey design which overlooked or no longer held evidence of different occupations at the same locality. The sites discussed here serve merely an illustrative purpose for the type of data collected from Early Archaic sites in the Wamsutter region (Figure 5.11). Both sites share a number of similar characteristics. Each site aspect faces to the north or northeast and located on high ground with a wide angle view of the surrounding terrain. All hold sparse lithic evidence, although one site, 48CR3347, possesses a cluster of nine hearths and other non-lithic evidence.

48CR3343

Located on a north facing slope overlooking a small dry playa, six artifacts were recovered from terrain moderately covered with vegetation. A single bifurcated Early Archaic projectile point of brown bioclastic chert similar to points from the Laddie Creek site (Frison 1991:84), was recovered. The distal end of a chert biface and a unifacial retouched chert blade complete the tool assemblage. No hearths or fire-cracked rocks were noted.

48CR3347

Represented by an extensive lithic scatter and a cluster of nine hearths visible on the surface, 48CR3347 holds a commanding 360 degree view of the surrounding area from a hilltop. A wide variety of lithic materials, debris, and debitage was noted. Smith (1981) suggests the three side-notched projectile points recovered from the surface are reminiscent of Lockingbill and Laddie

Creek types. Two cores and numerous decortication flakes of local raw material indicate primary lithic reduction as a significant site function. Retouched flakes and side scrapers suggest a wider variety of site activities than the previously discussed site. Finally, a single, small humerus of an unidentified artiodactyl was also documented. However, since it was recovered from the surface it is impossible to determine if the faunal evidence is contemporaneous with the Early Archaic Period occupation.

Middle Archaic

The Middle Archaic is represented by 112 identifiable components in the Wamsutter project, 52 (46.4%) of these were recorded as single component sites (Figure 5.12). In the High Plains, the Middle Archaic represents the first significant evidence of plant food exploitation as a regular part of a seasonal subsistence base (Frison 1978, 1991). Most frequently the McKean Complex is most often associated with the strongest evidence of plant utilization in the Middle Archaic. It should be reiterated that the McKean Complex is associated with wide scale Plains adaptations. Frison (1978:352-354) regards the McKean Complex as the florescence of plant food processing adaptation. Regardless of the inferences drawn from the presence of manos and metates in a number of Middle Archaic assemblages, actual evidence of preserved plant foods remains sparse (Keyser 1986). Grinding slabs and manos in McKean sites in the Dakota Black Hills has been tentatively suggested as faunal processing tools for the production of 'bone grease' in winter camps (Tratebas 1985:144). The idea that small animal bones were ground into paste on grinding slabs is not new (Frison 1978), but such interpretation is problematic without more conclusive evidence.

However, evidence of communal bison hunting continues to dominate subsistence studies. Although arroyo traps like those of the Paleoindian and Early Archaic Periods remain the most popular procurement method, use of jumps and corrals are found as well (Frison 1978, 1991). The use of a sturdily-constructed corral is documented at the Scoggin site several miles west of the North Platte River north of Rawlins, Wyoming, on the eastern boundary of the Wyoming Basin (Lobdell 1973,1974). Such construction is clear evidence of the high degree of cooperation and social organization necessary to undertake such a venture. The degree of intensive processing of the bison at the Scoggin site is greater than at similar period sites in the Powder River Basin in northeast Wyoming. Believed to be one, or possibly two Fall kills, the faunal evidence indicates near total use of each carcass, including a feature similar to a Late Prehistoric boiling pit located outside the corral. Long bones exhibited breaks for removal of marrow and the skeletons were thoroughly disarticulated, evidence of removal of every available scrap of meat. The complete butchering was interpreted as demonstrating the relative scarcity of bison herds in the Wyoming Basin (Miller 1985:152).

48CR3271

This site is a small concentration of lithic debris and tools on the crest and the west slope of a small dunal rise. An access road to a well pad cuts through the site. Road construction turned up some debitage from below the surface. Although sparse, the lithic assemblage represents a variety of activities. The presence of small pebble cores and simple retouched pebbles suggests expedient activities during a short term occupation. Only the recovery of a complete mano argues against such an interpretation.

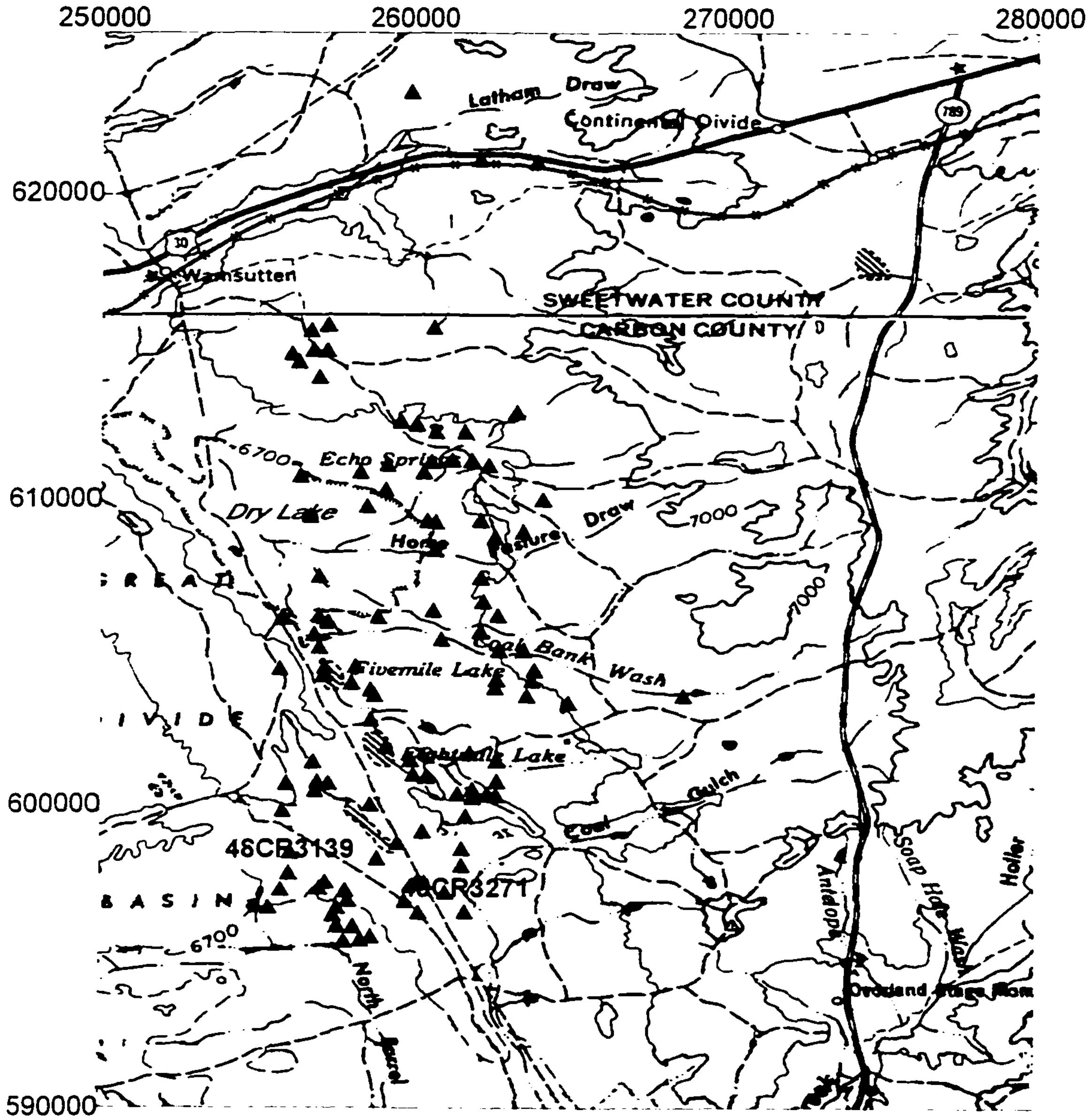


Figure 5.12. Middle Archaic Components

Solid triangles denote the Middle Archaic components documented in the Wamsutter Survey. Sites identified are those discussed in the text.

48CR3139

This is a large site consisting of more than 170 tools, a large portion of which represent butchering activities (i.e., 50+choppers, 15+knives, scrapers, an unnumbered group of core tools, and 100+utilized flakes). The site stretches along both sides of a steep walled arroyo for approximately 385 meters. On the east side of the arroyo, there are at least four distinct concentrations of tools and debris of over 2000 flakes on a broad plain. One definite hearth and other probable hearths were noted on the surface. One Mallory side-notched point characteristic of the Middle Archaic Period was recovered. Three manos were noted as well. In addition to the lithic material two fragments of unidentified bone, with probable butchering marks, were observed in the arroyo. Some distance down the arroyo, a modern bison skull was discovered eroding out of the arroyo wall. Another Middle Archaic site, 48CR2726, lay nearby with a single McKean point, five other tools, and a small number of flakes. An association between these different sites could not be determined (Schoen 1981).

Late Archaic

A total of 210 Late Archaic components were recorded, 127 (60.5%) of which were recorded as single component sites (Figure 5.13). This time period represents the largest contingent of identified sites in the Wamsutter project. In many respects, this period represents a continuation of the large scale hunting documented during the Middle Archaic.

48CR830

This site complex is defined by 10 distinct lithic concentrations primarily located on the south slope of a large ridge overlooking a playa to the west with a small hill to the northeast and a major intermittent drainage along the

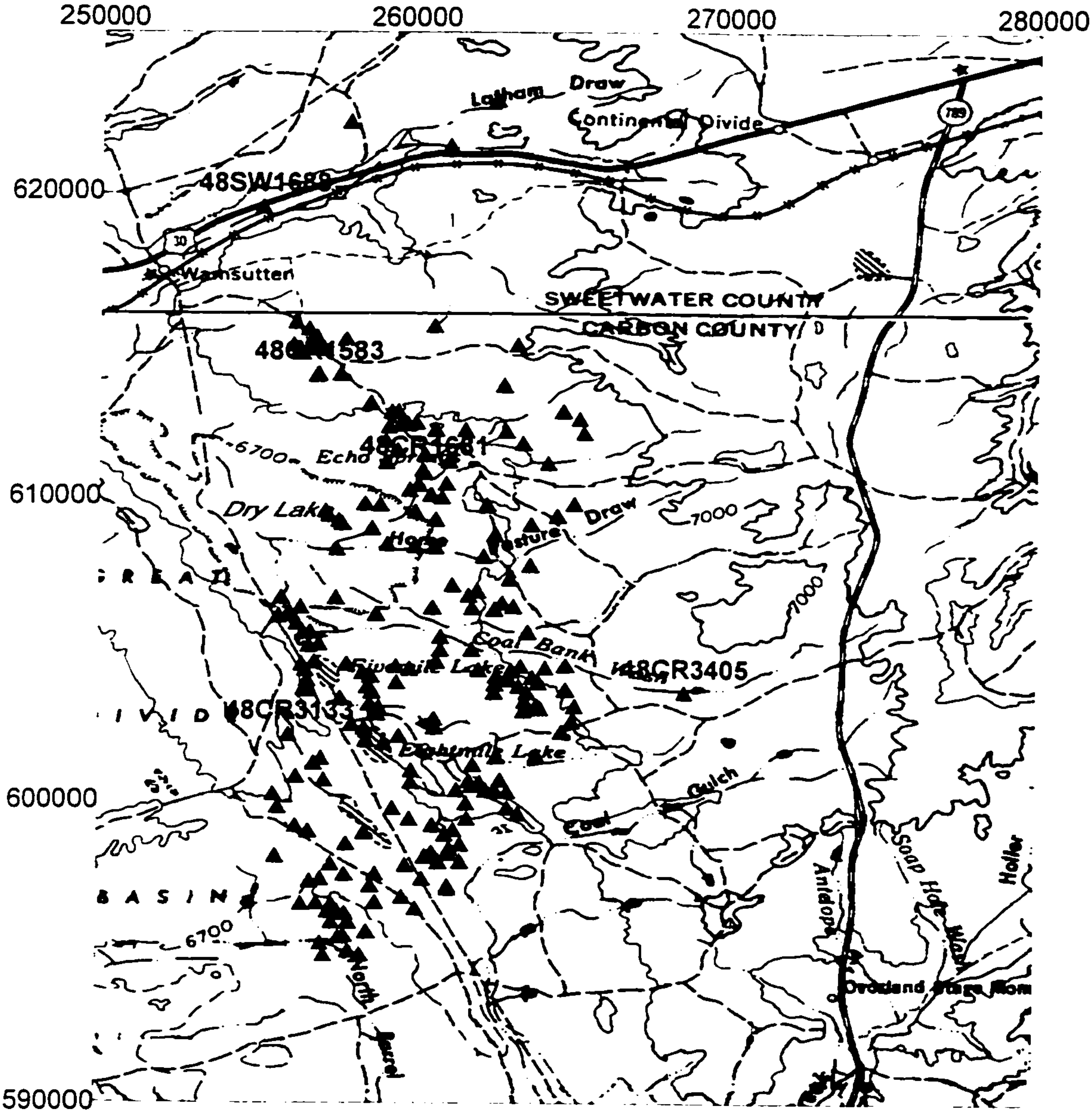


Figure 5.13. Late Archaic Components

Triangles indicate Late Archaic components. Sites identified are discussed in the text.

southern base of the ridge. The concentrations of lithic material suggest both plant and animal processing in specific activity areas (Stilphen 1981). Numerous artifacts were recovered from the drainage which appear to have eroded from the walls the drainage or to have been carried downstream from higher upslope. Cultural material was observed to a depth of 40 cm within the walls of the drainage cuts.

Eighteen cores as well as more than 7,000 flakes of debitage, including obsidian and Moss Agate found to the west in the Green River Basin, suggest intense and long term utilization of the area. Although Stilphen (1981:5), noting the numerous small ephemeral sites located to the west upon the flat open playa area with numerous intermittent drainages, suggested they may represent procurement sites that provided game to be processed at the better protected and larger slopes of site 48CR830.

<u>48CR3133</u>

The site occupies an entire ridgetop and slopes which overlook Eightmile Lake to the east. The majority of eight defined concentrations are situated along the crest of the ridge, providing an unobstructed view to the north, east, and south. Lithic materials are sparse on the southwest facing slopes and in eroded areas. The slopes are cut by many run-off drainages, as well as deep arroyos, thereby destroying some site integrity. In addition, the authors of the site report suggest that pot-hunting may have taken place within the area due to road construction and the small number of diagnostic artifacts relative to the size and plethora of other artifacts (Winham and Hough 1981a). The quantity and variety of scrapers and gravers suggest a concentration of bone and woodworking tools. Diagnostic artifacts identify the assemblage as Late Archaic; although the extensive scatter of material over

10 separate concentrations certainly suggest the possibility of multiple occupations.

Late Prehistoric

Although the number of Late Prehistoric components documented by the Wamsutter Project number fewer than the Late Archaic Period, it was the initial comparisons between these assemblages that suggested significant differences between the two periods. The decline in the occurrence of cores on sites dated to the Late Prehistoric provided the initial impetus to undertake this investigation. A total of 171 Late Prehistoric components were recorded, 112 (65.9%) of which were single component sites (Figure 5.14). For the most part, these sites yielded the greatest relative diversity, albeit not statistically significantly so, of lithic material. On the other hand, intrasite tool diversity declines during this period. Figure 6.9 illustrates the decreased range of tool assemblages documented during the Late Prehistoric Period. These changes, in terms of lithic diversity and tool categories, are addressed in Chapter Six.

48CR1681 (Echo Springs)

A marshy depression surrounded on three sides by high ridges marks the center of the highest concentration and greatest diversity of Late Prehistoric materials recorded during the Wamsutter survey (Figure 5.15). A small drainage channel flows southwest along the northwest boundary of the site. The surrounding ridges exhibit extensive sheet wash which indicates that the drainage channel and the table-like land around the spring is aggrading. Echo Springs Road passes to the north of the site. Currently, a 20th century grain bin and wooden stock corral occupy the east side of the spring.

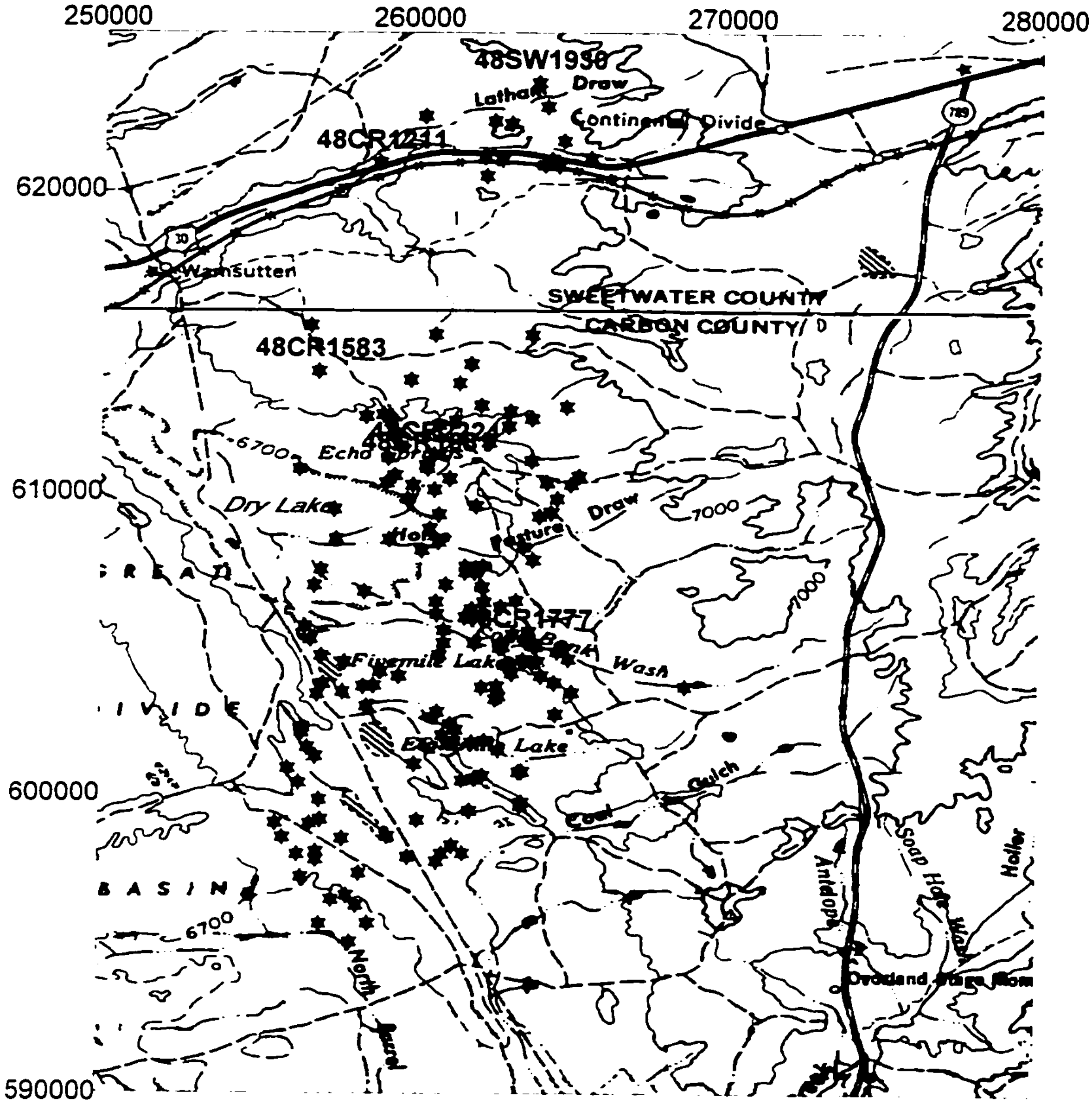


Figure 5.14. Late Prehistoric Components
Stars designate Late Prehistoric Components. Sites identified are discussed in the text.

Seven hearths were recorded at Echo Springs (Figure 5.15). Three hearths are located north of the basin , and four hearths are located to the east and south. Excavation of shallow V- ditches as part of road drainage exposed a single hearth (B) a meter below ground surface within the site area. Excavation of hearths A, B, and C, on the north side of the basin, were revealed them to be shallow and basin-shaped with small burned sandstone fragments present Hearth B, partially destroyed by the Echo Springs Road drainage ditch, yielded three gray oolitic chert flakes.

In all, a total of 129 tools were identified from Echo Springs, including 42 whole or partial projectile points. All, save two of these projectile points, were small, triangular-notched or corner-notched Late Prehistoric points. The two exceptions are point midsections which appear older: One is lanceolate with a diamond-shaped cross section exhibiting collateral flaking, and the other is a stemmed Archaic point. Scrapers, bifaces, and utilized flakes occur in great numbers. The presence of butchering and hide-working tools indicate hunting and animal processing at the site.

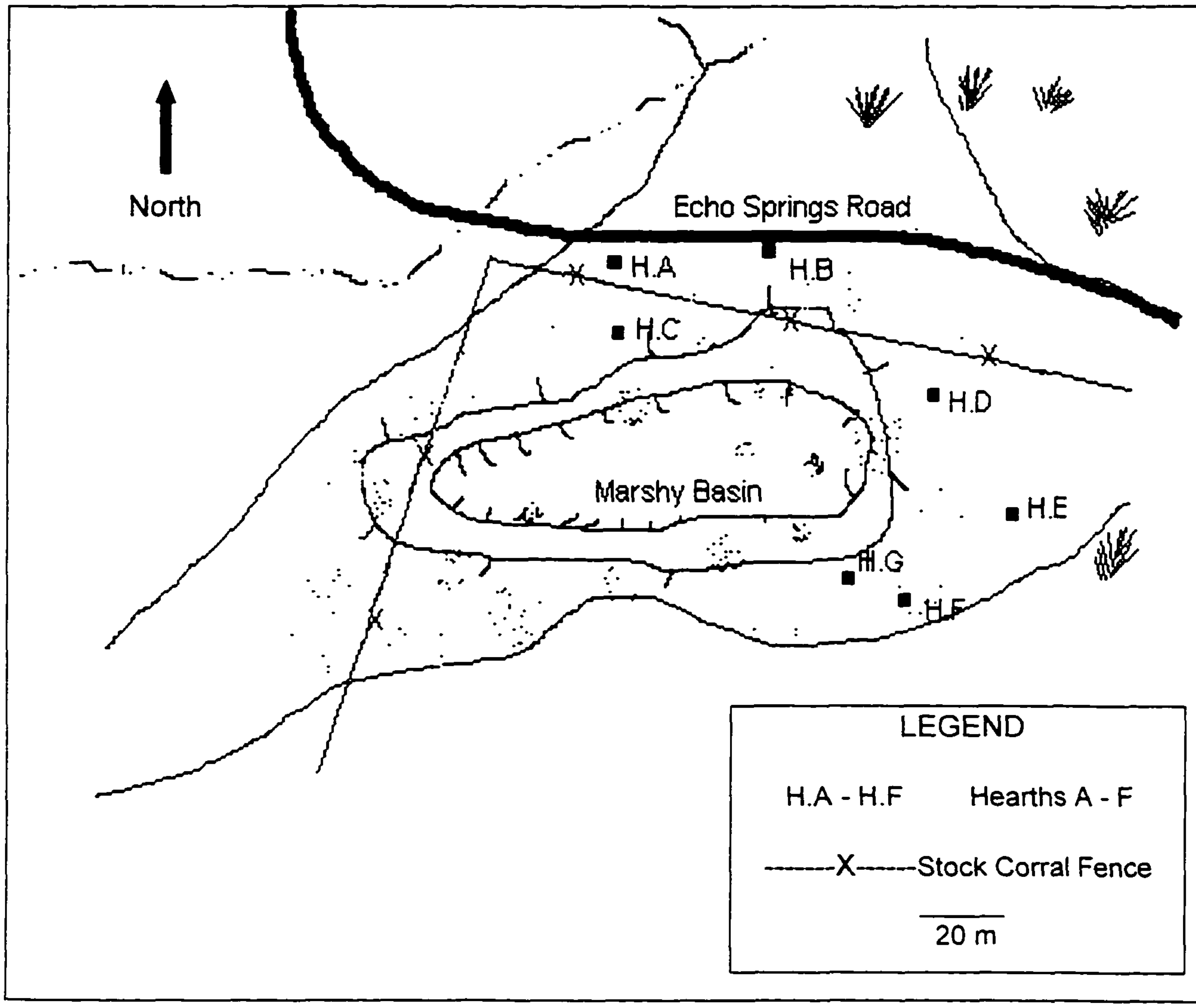


Figure 5.15. Echo Springs, 48CR1681

No ground stone implements were recovered from Echo Springs. However numerous sites are located on the surrounding ridges and hilltops that overlook Echo Springs. At least 36 sites lie within a kilometer of Echo Springs, most are Late Prehistoric in age. The nearest site, 48CR2224, extends into Echo Springs Road and yielded two conjoinable fragments of a mano. Located approximately 220 meters to the north of Echo Springs, the center of the lithic scatter lies atop a flat ridge. Site 48CR2224 lacks evidence of any hearths and, although it possesses a thinner scatter of debitage over a much wider area than Echo Springs, the site contains similar lithic material, including flakes of obsidian. Middle Archaic and Late Prehistoric projectile points were recovered as well.

Chapter VI

ANALYSIS OF WAMSUTTER SURVEY

For the High Plains, the common assumption has been that hunting and gathering, characterized primarily by bison hunting, remained relatively unchanged from the Paleoindian Period until Historic contact (Frison 1991). The only notable change is an apparent rapid increase in population at the transition between the Late Archaic and Late Prehistoric Periods. Metcalf (1987:252), Michaelson (1983:62), and Mackey *et al.* (1982:45) document this increase in population as reflected in increased radiocarbon dates in various areas of Wyoming. In conjunction with this hypothesis, they believe that increased evidence of hunting, as well as a greater reliance on seed foods, is a result of increased population during the Late Prehistoric Period (Smith 1988:251). Some have suggested the apparent increase in population is attributable to the introduction of the bow and arrow approximately A.D. 500 and, to a lesser extent, the introduction of ceramics (Harrell 1989:5.27). Although the increase in dated Late Prehistoric sites is real and not the result of erosion, deflation, soil perturbation, and other natural site destruction activities, it is my contention that rapid population growth need not the only viable explanation.

Frison, for example, suggests that increases in radiocarbon dates

> cannot be accepted as accurately reflecting the number of prehistoric occupations present since energy resources are not equally distributed. However, they do suggest quite strongly that something ecologically significant was happening toward the end of the period (1991:109).

It is argued here that change in settlement/subsistence patterns as a response to ecological changes can partially explain the sudden threefold increase in Late Prehistoric sites in southern Wyoming. Before examining the evidence from the Wamsutter Block Area Survey regarding settlement patterns and population growth, it is worthwhile to review previous research regarding the relationship between production of lithic assemblages and prehistoric subsistence systems.

As noted in the preceding chapter, the data derived from the collected Wamsutter survey reports are limited to broad categories of artifacts, but still offer potential for the discovery of discernible trends in settlement systems. The readily available raw lithic material in the Wamsutter region argues for interpretation of organization of lithic technologies in terms of differences in settlement systems. As has been pointed out many times, a geographic locality can be occupied repeatedly, but for different purposes, through time. Those cultural traits brought to bear on a region can vary depending on the extractive tools seeking resources in an efficient manner. Others have sought to utilize the concepts discussed here in regions of Wyoming with varying degrees of success. Eckles (1985) studied culture change in the Powder River Basin from the Middle Plains Archaic to the Late Prehistoric Period. His conclusions, particularly in light of the results from Wamsutter, will be addressed below. On a more general level, Francis (1980) discusses tool production and procurement practices during the Paleoindian Period of the Northwestern Plains, by comparing and contrasting data from 30 Paleoindian sites from Wyoming, Montana, and Colorado with their subsequent regional Archaic manifestations. Francis (1980:13) rightly warns of the difficulties and limitations of deriving data from biased sources of lithic type descriptions and limited variety (kill sites) of recorded sites. Such warnings are not without merit. Finally, the results of an intensive archaeological survey in an overlapping portion of the same Wamsutter region examined lithic assemblages in regards to local versus non-local lithic types and the 'mini-max' hypothesis which suggests that sites are located to minimize effort in acquiring quantities of resources (Michaelson 1980, 1983).

We must determine what marked differences occurred in settlement patterns through time within the Wamsutter survey data. Although data suggest several differences, the decreased frequency of cores between Late Archaic and Late Prehistoric sites is the most glaring (Table 6.1). Twenty-nine percent of the single component Late Prehistoric sites recorded by the Wamsutter survey contained cores in their artifact assemblages, while 50 percent of the Late Archaic sites recorded cores.

In regard to the use of cores in south-central Wyoming, the data from the Wamsutter Survey does not lend itself to specific determination of type of cores. Amorphous, polyhedral, or prepared cores were not differentiated in the reports. However, it is probable that many of the heavy bifaces categorized as choppers were, in fact, large bifacial cores that only served a secondary purpose as heavy-duty butchering tools. The plentiful supply and variety of lithic materials and an informal examination of those cores illustrated in the Wamsutter survey reports suggests a preference for an amorphous core technology.

Amorphous cores are commonly recognized as evidence of an expedient lithic technology (Johnson 1987; Parry and Kelly 1987) or abundance of material (Gramly 1980). The abundance of lithic material in the Wamsutter region suggests an amorphous core technology. Although formal polyhedral cores have been recovered from the region, they appear to be the exception. For our purposes the mere presence or absence of cores is the important factor. Others have discussed at length the significance of cores as an indicator of mobility (e.g., Kelly 1988; Bamforth 1986).

Determining if the occurrence of cores in a lithic assemblage is significant is a practical question. Comparison of actual numbers of cores could potentially lead to questions of sampling error, especially when it has been pointed out that "cores could become over-represented in the surface if abandoned cores were selected for re-use and functioned as an expedient secondary source of raw material" (Coinman *et al.* 1989:220). An over-represented occurrence of cores on prehistoric surfaces was demonstrated in Late Paleolithic sites in Jordan. Coinman discovered a disproportionate number of cores on buried surfaces of a well stratified rock shelter in Jordan. They hypothesized that as the rock shelter was periodically reoccupied, the inhabitants would pull up partially buried cores found in the floor of the shelter to utilize the lithic material. Coinman (1989:220) was able to demonstrate that these cores were not be randomly distributed through the fill within the cultural strata uncovered in the rockshelter, but rather located more closely to the ancient floors.

Such a idea is similar to Binford's description of site furniture being left behind at Nunamiut sites in Alaska. When sites are reoccupied items or features such as hearths, anvils, or other less portable items, including raw material, were cleaned or pulled to the surface for re-use (Binford 1979:264). It is not impossible that reoccupation of a site would include the recovery of partially buried cores, thus skewing a distributional sample of a stratigraphically defined assemblage of any repeatedly occupied site.

Table 6-1. Core Frequency

Late Archaic and Late Prehistoric Sites		
Cultural Period	Cores Present	Cores Absent
Late Archaic	63	63
Late Prehistoric	33	79
χ^2=10.39	P<.001	df=1

Table 6-2. Wamsutter Cores Identified by Material

Material		Middle Archaic	Late Archaic	Late Prehistoric
Chert	Oolitic	4	9	12
	Bioclastic	29	27	20
	Gray	9	16	16
	Unknown	1	3	1
	Gray	0	4	2
Exotic		0	12	11

Paleolithic sites in Jordan have demonstrated the over-representation of cores on buried cave floors as a result of their being selected for reuse and expedient secondary sources of lithic material (Coinman *et al.* 1989:220). The reuse of hearths in the Wamsutter region has been demonstrated by radiocarbon dates separated by thousands of years from samples collected from arbitrarily collected levels of fill from individual hearths (Schoen 1981d). In fact, retrieving partially buried cores would favor any analysis based on the presence or absence of cores at a site because it reduces the possibility of missing cores in a surface survey.

However, can such a reduction of a sample provide a significant indication of cores as an indicator of subsistence/settlement strategies? The difference in occurrence of cores between the Late Archaic and the Late Prehistoric, both in frequency and occurrence, is not random (Table 6.1, Figure 6.2). If we accept the presence of cores as evidence of primary tool production then it is probable that such tool production decreased as a significant aspect of the Late Prehistoric Period in the Wamsutter area. The results of the analysis above demonstrate that core production and thus primary tool production was no longer embedded in the Late Prehistoric cultural manifestations of the region. While significant, other evidence can demonstrate the range of prehistoric activity. Bear in mind that the Wamsutter area sites were assigned, for the most part, to cultural periods by diagnostic projectile points so the bias of hunting holds equally for both periods. A comparison of the mean numbers of cores found on sites from the Middle Archaic through the Late Prehistoric demonstrates a distinct decline in their frequency (Figure 6.2). The number of sites documented with cores has

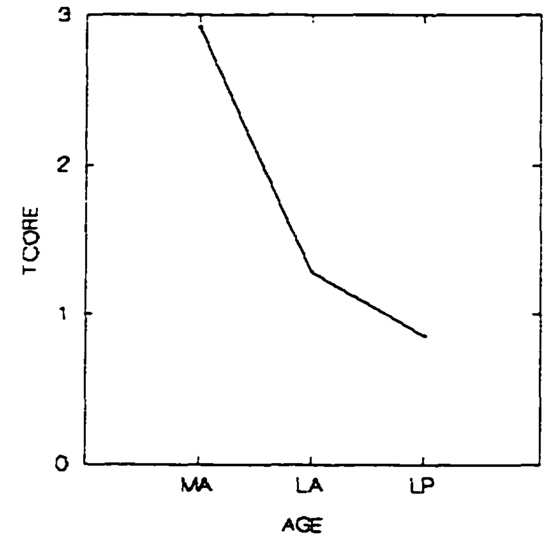


Figure 6.1. Mean Core Count:Middle Archaic to Late Prehistoric
MA= Middle Archaic, LA=Late Archaic, LP=Late Prehistoric
This illustrates the decline in the number of cores only among sites containing cores.

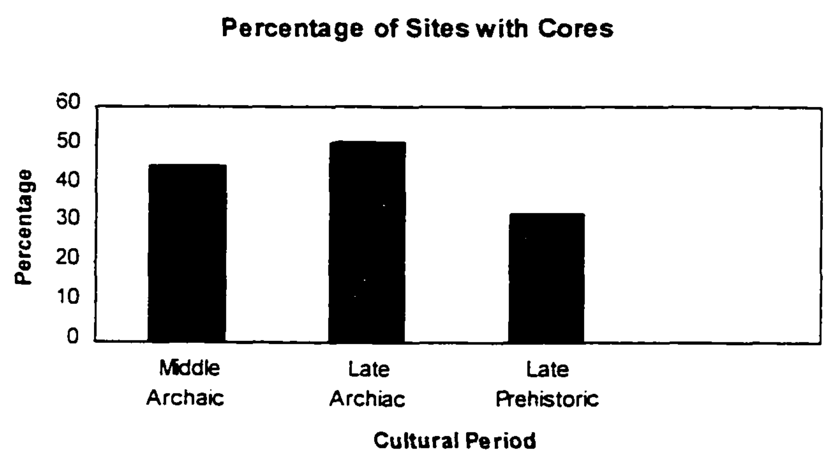


Figure 6.2. Percentage of Single Component Sites with Cores

Figures 6.1 and 6.2 demonstrate both the decline in sites bearing cores as well as the mean number of cores occurring on sites.

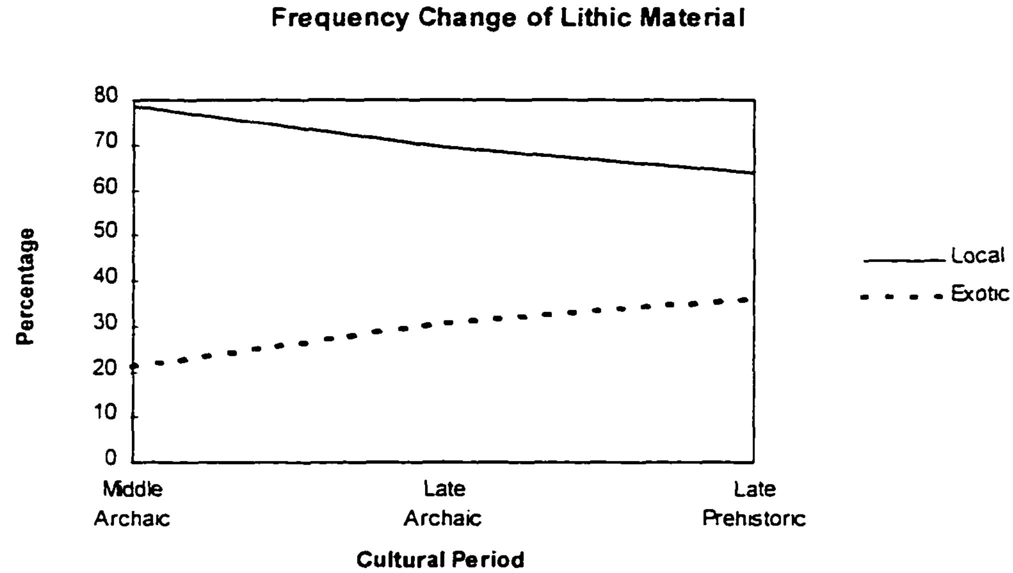


Figure 6.3. Relative Frequency of Local versus Non-local Lithics

Changes are measured by the projectile points identified by lithic material. The frequency of Exotic materials seems to increase between the Late Archaic and the Late Prehistoric.

Table 6-3. Wamsutter Projectile Points

Raw Material		Middle Archaic	Late Archaic	Late Prehistoric
Chert	Oolitic	17	21	7
	Bioclastic	44	102	101
	Gray	0	16	4
	Unknown	11	28	29
	White	1	7	11
Quartzite	Gray	9	8	11
Exotic		8	40	47
TOTAL		90	222	210

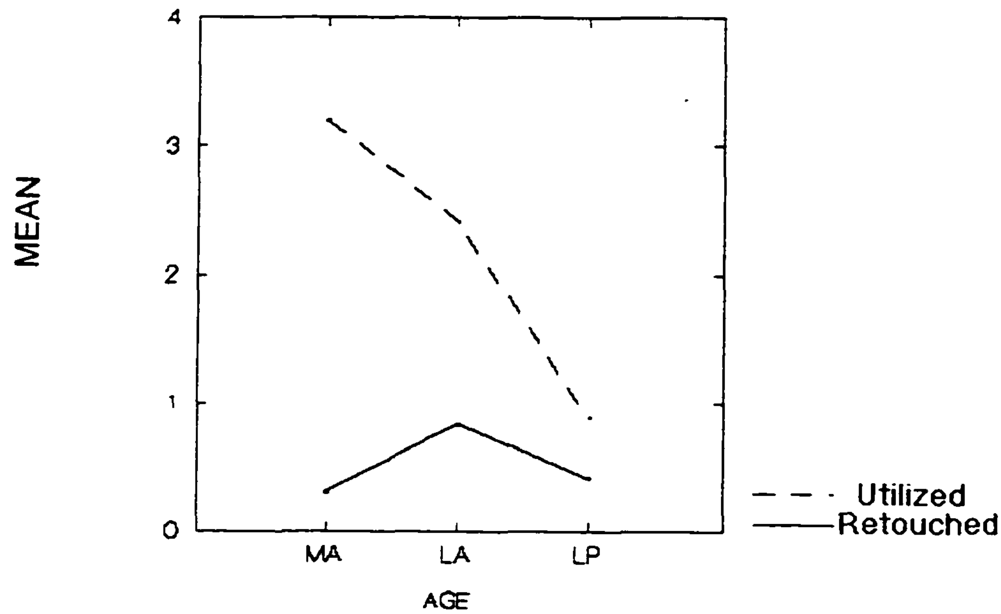


Figure 6.4. Diachronic Comparison, Retouched / Utilized Flakes

MA= Middle Archaic LA= Late Archaic LP= Late Prehistoric
The steep decline in the occurrence of flake tools supports scheduled activities in the Wamsutter region.

previously been discussed in Table 6.1. A calculation of the percentage of sites possessing cores is also informative. Forty-five percent (24/55) of Middle Archaic sites contained cores in their assemblages, 51 percent (65/128) of Late Archaic sites, and only 30 percent (33/111) of Late Prehistoric sites (Figure 6.2) The data reveal not only a remarkable drop in the number of sites possessing cores, but those Late Prehistoric sites with cores contain fewer. In conjunction with this decrease in frequency of cores, Figure 6.6 indicates a corresponding increase in bifaces during the same time period. As discussed earlier, the increased frequency of bifaces in tool assemblages is often interpreted as evidence of increased mobility (Bamforth 1986; Parry and Kelly 1987; Kelly 1988). During the Late Prehistoric Period in the Wamsutter region the evidence points to an increase in bifaces among tool assemblages.

The conclusion reached above is in direct contradiction to evidence presented by Eckles (1985) of lithic material and tool types collected from surface sites and excavated assemblages from four bison kill sites in the Powder River Basin of northeastern Wyoming. Eckles argued that evidence of greater curation of stone tools and a corollary decrease in non-local lithic materials over the time span in question pointed to population increases which restricted mobility and accessibility to non-local raw materials. Eckles interprets the lithic data as inferring that the inhabitants of the Powder River Basin became increasingly cut off from lithic resources in the Black Hills and Montana as populations moved into the area from Canada and the Great Plains. If such is the case, then the continued relative frequency of non-local lithic material in the Wamsutter region infers greater mobility or a social network that allowed exchange of distant raw material.

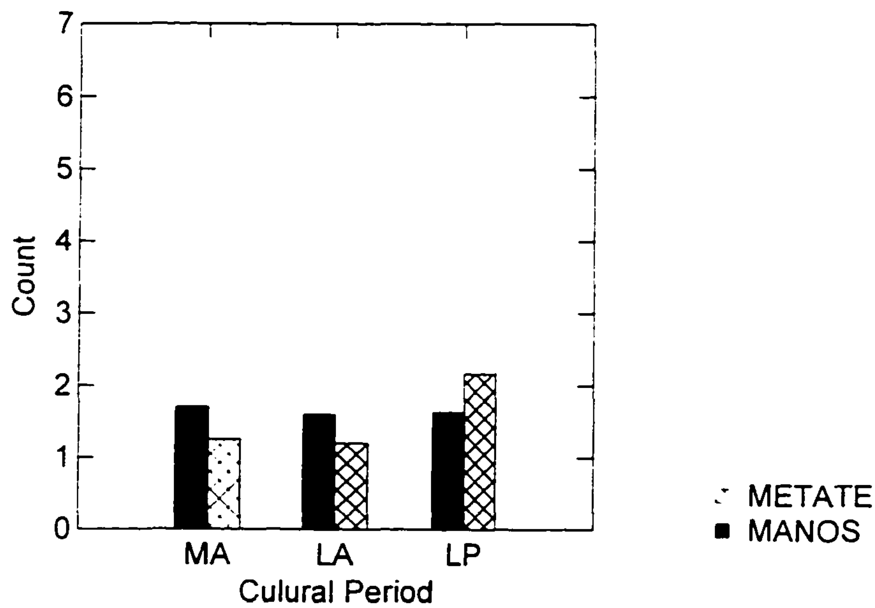


Figure 6.5. Wamsutter Grinding Stones
MA= Middle Archaic LA= Late Archaic LP= Late Prehistoric

While the number of manos remains relatively unchanged, the number of metates nearly doubles during the Late Prehistoric.

An objection to Eckles' study is the heavily weighted bias of using lithic assemblages from kill sites as the major portion of his data base. A broader, regional sampling approach offers better prospects to discern a greater range of cultural activities of a region's prehistoric inhabitants. In either case, the restrictions represented by the limited assemblage recorded in the Powder River Basin are not present in the Washakie Basin.

In the same vein, Michaelson's (1980, 1983) analysis of lithic scatters in a portion of the Washakie Basin to the east of the Wamsutter area led her to propose that Late Prehistoric groups had become centralized into bands and exploited a larger area than earlier Archaic groups of the region. However, she felt her sample size of dated Late Prehistoric sites (N=10) was too small to allow testing the hypothesis. Wamsutter data supports her contention that the Late Prehistoric peoples may have been less dependent on big game hunting. From her data Michaelson (1980) speculated that Late Prehistoric groups were practicing a generalized foraging strategy over a larger area than earlier Archaic peoples. Results of the Wamsutter survey provides support of her assessment of territoriality during the Late Prehistoric in the Wyoming Basin.

The Wamsutter data supports Michaelson's contention that the Late Prehistoric indicates a decrease in reliance on big game hunting. An increase in the quantity of grinding stones among Late Prehistoric sites is illustrated in Figure 6.5. An increase in numbers of grinding stones corresponds to a greater utilization of plant foods. In conjunction with the aforementioned change in core production and increase in grinding stones a further examination of raw material as exemplified by projectile points shows a decrease in local material utilization. Table 6.3 displays a 19% decrease among the local oolitic, bioclastic, and gray chert projectile points found in the Wamsutter area between the Late Archaic and Late Prehistoric Periods. There is a corresponding increase in the non-local raw materials (Figure 6.3).

Past archaeologists have inferred, and in many cases wholeheartedly accepted, the commonly held belief that raw material sources correlate closely with territory or mobility reflected in seasonal rounds in settlement/subsistence systems (Wilmsen 1973; Meltzer 1984). However, the accuracy of such inferences has recently been challenged. Using simulations of differential resource exploitation to derive corresponding variation in lithic assemblages recovered in archaeological context, Ingbar (1994:54) concluded that proportions of lithic materials at any given site is linked as much to behavioral patterns of settlement and scheduling as to the proximity of the source material. Estimates of territorial range based on frequencies of source materials can lead to spurious conclusions (Ingbar 1994)

A relative increase in non-local material utilization in conjunction with a decrease in utilization of local material suggests direct procurement from a wider territory or some social interaction based on an established network (Table 6.3). An increase in the occurrence of non-local material is frequently interpreted as evidence of a wider territory utilized in a patterned seasonal subsistence round or as an increased level of social interaction with adjoining social groups.

Evidence from the Wamsutter project argues for increased specialization, not generalization, of recovered tool kits and lithic materials. In several categories of the Wamsutter data a greater degree of prior planning is reflected in the lithic assemblages of the Late Prehistoric Period when contrasted with the Late Archaic. To digress for a moment, the distribution of cores displays a statistically significant decline during the Late Prehistoric period in the Wamsutter region (Table 6.1). This is but the first indication that more specialized activities were occurring at this time as opposed to more generalized activities, as proposed by Michaelson. Primary tool production was no longer a significant activity for the region during the Late Prehistoric Period. By Binford's description (1980:7), the lithic sources in the Wamsutter area are no long "mapped on" as part of the patterned subsistence round. Although it is obvious that the Wamsutter region continued to play an important role in subsistence, the evidence seems to indicate that residential occupation of the region gave way to specialized activity stations with a significant decrease in quarry or lithic workshop activities. These endeavors were part of a broadening of the subsistence base as general foraging increased in response, through broad based hunter/gatherer subsistence patterns, to shifts in the ecological setting of the region.

Specialized subsistence activities is predicated on prior planning. For example, organized communal bison hunts are frequently held up as the model of such specialized activities on the Great Plains. These hunts involved planned "gearing up" in preparation for the hunt (Binford 1979), division of labor in butchering (e.g., Wheat 1972, Reher and Frison 1980) and, in ethnohistoric accounts, religious activities to insure success in hunting (Frison 1991). The changes reflected the Wamsutter data support the supposition that small scale hunting camps were established as part of an overall subsistence scheme involving prior planning during the Late Prehistoric Period. Figure 6.4 illustrates the marked decrease in utilized flakes through time of single component sites in the Wamsutter region. These sites represent fewer expedient tools and a corresponding reliance on retouched flakes and bifaces, curated tools carried in anticipation of need.

As these sites become more specialized through time the diversity of recovered tools also decreases. Figure 6.7 presents the results of examining the decreasing number of categories of tools recorded on these sites. The decrease in diversity of tool categories occurs abruptly between the Late Archaic and the Late Prehistoric.

The question becomes not how mobility may have a significant impact on the organization of a hunter/gatherer tool assemblage, but rather how this mobility reflects a response to significant shifts in the available resources of a region. Kelly (1995:120) correctly identified Binford's concern with his forager-collector continuum as making the case that mobility is related to the environment. Environmental episodes of warmer winter temperatures, or greater spring rainfall could substantially alter the available resource base in a region. Times of plenty should be reflected in the artifact assemblages left behind as a mute reflection of environmental degradation or aggradation. Changes in assemblage content and site location reflect this adaptive process. The increase in non-local lithic raw materials and evidence of greater prior planning (e.g., increase in biface production demonstrated in Figure 6.6) on the part of Late Archaic and Late Prehistoric populations in comparison to the Middle Archaic suggest greater mobility of these latter populations. These changes are related to an increased logistical subsistence strategy from the Late Archaic through the Late Prehistoric Period.

Kelly's (1995) evaluation of various foraging models derived from ethnographic studies suggests useful application to the Wamsutter data. The higher levels of mobility are suggested by the decreasing diversity exhibited in

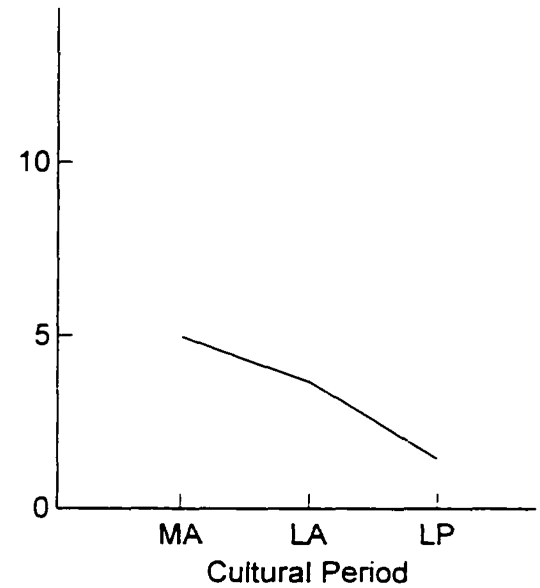


Figure 6.6. Core:Biface Index

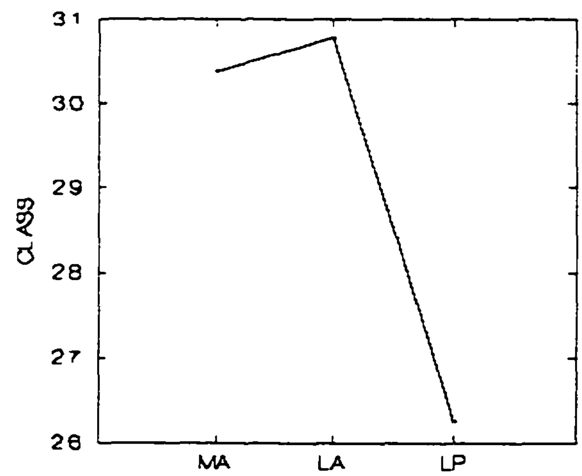


Figure 6.7. Frequency of Artifact Classes

MA=Middle Archaic, LA=Late Archaic, LP=Late Prehistoric.

A substantial decrease in diversity of tools found on single component sites is well illustrated.

Figure 6.7. Kelly (1995) pointed out that while residential sites increase in assemblage diversity in the ethnographic record, the diversity of special use sites (i.e. hunting stations, kill sites, caches) should be more restricted in total assemblages because these sites are produced by more precise scheduling. It is suspected that the greater diversity of residential sites is masked, at least in part, by the multicomponent sites in the Wamsutter region. Those single component sites discussed here become more specialized through time, hence smaller and with less diversity in tool assemblages. Figures 6.6 and 6.7 both reflect the decreasing diversity documented on the Wamsutter sites. The less diverse assemblages characterized by Late Prehistoric Period sites reflect a greater preponderance of hunting stations during the late Prehistoric Period. Those Late Prehistoric sites excavated in the Wamsutter region reflect this decrease in diversity as well as surface collected sites. It is noteworthy that no evidence of storage facilities, pits or stone lined cairns, were documented in the Wamsutter region. This absence of storage facilities supports the idea that long term residential sites were not part of the region's settlement pattern.

The problem, of course, is in distinguishing the association of the plethora of artifacts from among the palimpsest of multi-component surface sites. Though numerous factors, both natural and cultural, form such repeatedly occupied sites analysis has yet to yield those variables which caused selection of a specific loci of human habitation. While it can be argued that the scale and focus of occupation of the Wamsutter landscape changes through time it is the goal of this research to provide a method of incorporating the small lithic scatters into a broad understanding of these changes through time.

Increasing curation rates and fewer categories of tools on sites support the proposition that specialized hunting stations substantially increased the number of identifiable sites in the Washakie Basin. Scheduled hunting forays leave less diverse discarded tools. Kelly addressed similar questions in his analysis of Great Basin mobility where, couched in Binford's terminology, he pointed out that "residential sites of collectors should increase in assemblage diversity relative to assemblage size more rapidly than residential sites of foragers" (1985:256). The rapid increase in radiocarbon dates can be, in part, attributed to this shift in subsistence and settlement patterns. Evidence from the Powder River Basin supports Eckles' explanation of increased population competing for restricted resources as a result of population pressure from the east (1985:167). My findings suggests this is not the case in the Washakie Basin.

Chapter VII

Conclusions

Since the turn of the century, recognition that the archaeological resource base in the United States is rapidly disappearing has led to passage of various pieces of federal and state legislation collectively known as Cultural Resource Management (CRM). From these separate legislative acts, a business and bureaucratic web has evolved to encompass all federally owned or controlled land. Early hopes were for the protection of the dwindling prehistoric and historic archaeological record through systematic inventory and preservation. In those cases where preservation was impractical and a site faced impending destruction by burial, construction, or flooding, a carefully planned and executed recovery of a significant sample of the information was sought, or at least such was the intention. Of course, instances can be cited where archaeologists have hastily excavated a hearth, a burial, or other significant features in front of advancing earth-moving equipment or rising water impounded by a new dam.

For the most part, these expectations of further clarifying the prehistory of North America through large scale surveys and excavations from cultural resource management programs have fallen short. In some cases, the continuation of systematic survey and sampling, regardless of scale, has contributed little more than additional stored and forgotten boxes of collected artifacts from a plethora of sites and the issuance of too few poorly distributed reports. It even spawned a now familiar term, "gray literature." In some cases, these reports seem to have been written in a vacuum, failing to take into account previously acquired data from the same region. While this has been true to some extent in every region of the country, it has been especially true in the West, where the small-scale, short-term survey has been the norm for more than two decades. An entire generation of archaeologists could now spend a lifetime in the archives and warehouses of academic institutions, produce original, significant research, and never turn a spade of overburden from a site or walk a survey transect. There are those who foresee such endeavors as the future of archaeology in the United States (McGuire 1987:76).

After taking part in a number of relatively small-scale field surveys and test excavations on the High Plains of Wyoming it became apparent that much of the recovered data was simply being written up empirically, filed, and forgotten. No effort was made to address questions regarding the broad-scale prehistory of the area in question. As numerous private contract companies sprang up during the 1970s they brought a corresponding increase in methodologies and research designs, if, in fact, a research basis was allowed at all. Limitations, both procedural and budgetary, were placed on private contractors by various federal agencies given the task of overseeing the implementation of the Cultural Resource Management legislation.

Archaeologists should be able to utilize the diverse CRM reports available from a single region to derive some picture of culture change in that region through time. At least formulation of testable hypotheses for future research could be initiated on the basis of such analyses. Frison (1984) and others have criticized the lack of research design in carrying out the numerous survey projects that continue to be the mainstay of contract archaeology. Osborn, tongue firmly in cheek, suggests,

> If we assume as the inductivists and empiricists do, that our knowledge and understanding of the past is a direct function of the number of sites investigated and number of artifacts found, then we must have certainly learned a great deal about the past during the last decade (1987:9).

Too little attention is paid to the potential for syntheses of data being recovered. Such criticism can be found on the East coast as well. More than a decade ago Phelps wrote "in conceiving the management system the main omission seems to have been a means of synthesizing the monumental outpouring of information" (1983:14).

One day in the summer of 1980, as part of a large-scale archaeological survey of a portion of the Washakie Basin in south-central Wyoming, I stood on a windblown ridge much like others north and south of me, but this one was unique, for it marked the Continental Divide. From its vantage I could see survey crews from two other archaeological companies conducting surveys for other contractors. Thus, there were three groups of archaeologists working within sight of one another and yet we never spoke, never exchanged results, impressions, or ideas in regard to the prehistoric evidence we were so eagerly recording. This dissertation is an attempt to rectify that failure of communication.

Two goals were established at the outset of this study. First, to collate some of the voluminous data collected from a portion of the Washakie Basin of south-central Wyoming. Second, an attempt was undertaken to derive meaning from the mass of data derived from the hundreds of site forms and reports. In most instances, cultural resource management projects, especially in the case of small projects, are conducted in the absence of a guiding research design. This is not to say that an informal structure does not support the day to day efforts of archaeologist working in tandem with State Historic Preservation Offices around the country, but I for one have never been a proponent of cataloging and inventorying sites in rigid classification schemes. This, all too often, has been a bureaucratic response imposed on the task of preserving or recording the history and prehistory of our nation. What was once considered mundane or indecipherable may, one day, gain greater significance because of new theory, methods, or analytical technology or techniques. The preceding pages are offered as a demonstration of effective methods which can be brought to bear on such material, the gray literature of Cultural Resource Management.

Organization of technology studies lend themselves well to investigations of broad scope of regional scale incorporating hundreds of archaeological localities. To reiterate the opening chapter "Technological organization studies must 'draw back' from the single site and encompass a larger region" (Kelly 1994:133). Ideally one would like to trace an assemblage of stone tools from quarry through their use life trajectory as they shift in purpose and form until finally they are discarded, spent and broken. Because this is not possible, we are left with the search to acquire methods in which to filter out some, if not all, of the "noise" of re-occupied sites where the lithic debris represents seasonal subsistence patterns and the remains of the gamut of expedient to well planned curated events over the course of a single occupation. Regional organization of technology studies currently enable us to measure those factors of greatest amplitude that rise above the background scatter of the myriad of recorded sites.

One of the goals of past lithic technology studies has been to establish an association between lithic raw material acquisition, tool production, and discard with settlement strategies (Andrefsky 1991:130). At the broadest level, sedentary prehistoric populations have long been associated with an expedient tool technology and mobile populations with a formalized technology (Kelly 1985, Parry and Kelly 1987). However, the association between sedentary and mobile populations has been predicated on randomly distributed, localized sources of lithic raw material. In areas of abundant raw material, the situation can become more difficult to decipher (Gramly 1980, Wiant and Hassen 1984).

Evidence presented earlier suggests the lesser number of large herbivores in the Washakie Basin as due, in part, to the presence of sand dropseed and the absence of nutritious grass, blue grama. Bison would have been restricted to the Washakie Basin in the spring and early fall (Marlow 1982:349). The increase in small temporary Late Prehistoric Period sites with reduced variability in the tool assemblages suggest collecting game animals by small hunting parties in well planned forays from residential camps. It is this provocative increased hunting activity that provides an explanation for the sudden proliferation of Late Prehistoric radiocarbon dates. Evidence presented in the preceding chapter demonstrated the decrease in diversity of tools on identifiable sites (Figure 6.7) as well as a notable decrease in utilized flakes, the hallmark of expedient technology (Figure 6.4).

This evidence also argues for increased mobility in the Washakie Basin. This evidence of high mobility supports the contention that there was a low density of large game in the region during the Late Prehistoric. Kelly (1983) compiled ethnographic cases where residential groups broke into individual families as a response to decreased density of large game. In some cases this temporary fissioning of groups was in response to seasonal fluctuations in game availability.

It is acknowledged that periodic reduction in large terrestrial game population presents evidence that suggests increased sedentism in some circumstances. This alternative response is suggested by evidence in Great Basin regions of Utah (Kelly 1983, 1985). However, it is crucial that either substantial storage facilities are a stable resource base is available for a long term, minimal subsistence level (Kelly 1985:306). In the case of hunter-gatherers in the Great Basin anadromous fish runs and the greater biodiversity of the system of marshes and wetlands in certain areas provide greater diversity of usable resources. There has been no such evidence of extensive storage facilities in the Washakie Basin. Although playas are present in the Wamsutter region their annual short term existence and high salinity preclude a rich biome.

The increased occurrence of grinding stones (manos and metates) during the Late Prehistoric Period, while small, suggests an early summer occupancy of those Wamsutter sites possessing grinding stones. There is a correlation between grinding stones and dunes in the Wamsutter region. It may be that the occurrence of *Oryzopsis hymenoides*, a plant common on dunes found throughout the Unita Basin of northwest Colorado and northeast Utah (Graham 1937:45) and southwest Wyoming (Smith 1988), was a factor in site selection. Although dunes may have provided protection from the prevailing winds (see Figure 5.5) economic factors, such as edible seeds, may have played a role as well. The presence of *Oryzopsis* (Indian rice grass), a recognized prehistoric food source, is probably significant in understanding dune occupation. Other regions of similar environmental and ecological composition have noted the correlation between dune sites and the presence of *Oryzopsis* (Holmer and Singer 1983:45-46). In California, O'Connell (1975:18) noted that *Oryzopsis* seeds "can ordinarily be collected only during the short period between the time they ripen and fall to the ground ...seeds are available only during a two or three week period in late June or early July." Presumably, a similarly brief season occurs in southern Wyoming. Thomas, in his study of Great Basin subsistence patterns in Nevada, reiterated Steward's earlier finding that Shoshonean groups, after exhausting their winter stores of pinion nuts, moved to the flats to gather "Indian ricegrass" (1973:161).

A notable attribute of *Oryzopsis* is its drought resistant abilities. Seeds of Indian rice grass can lie dormant on the ground for up to seven years and then germinate with the first rainfall. Consequently, even in a drought plagued region *Oryzopsis* could recover quickly and reoccupy a dune area following rainfall.

The Late Prehistoric in the Washakie Basin appears to have experienced a seasonal dichotomy. Gathering plant resources, while significant, was limited to brief intervals during the summer months for *Orzyopsis* (Indian rice grass) and later for ripening *Chenopodium sp* (i.e. Goosefoot) (Smith 1988). Although seasonal occupancy of the Washakie Basin can only be speculated upon, it is worthy to note that the maturing of goosefoot coincides with possible seasonal presence of bison in the basin.

Distinguishing sites on the basis of function and examining their distribution across the landscape contributes to a better understanding of the organization of settlement and subsistence strategies (Michaelson 1983:73). Both Francis (1980) and (Michaelson 1983) suggested that the inhabitants of the Wyoming Basin practiced a generalized foraging economy during the Late Prehistoric Period. The data assembled from Wamsutter suggest that bands practiced a greater degree of specialized hunting activities as part of their adaptive response to the improved environment.

The relationship between tool assemblage size and mobility has been addressed throughout hunter-gatherer literature (Binford 1980, Kelly 1985,1995). Constraints due to the relatively high mobility of hunter-gatherer societies limit the number and degree of variety of tools (Torrence 1983:13). Analysis of these assemblages, in turn, offer inferences regarding the levels of available resources. The decrease in utilization of local raw material acquisition, coupled with a low level continuation of a exotic materials associated with Late Prehistoric Period sites, demonstrates a shift in adaptation to the environmental resources of the Washakie Basin while, at the same time, maintaining a wide territory that displays no evidence of more rigidly defined boundaries.

Evidence from Wamsutter reveal a startling shift in lithic assemblages between the Late Archaic Period and the Late Prehistoric Period. The greater mobility suggested by Michaelson (1983) is supported by the Wamsutter data. However, further investigations are needed to establish seasonally determined settlement patterns in the intermontane basins of southern Wyoming. This arguable shift could be attributed to a number of possible causes.

1) An alteration in the scheduled (seasonal) use of the region.
2) Arrival of groups (Fremont populations) with a subsistence structure better suited to the local ecology.
3) Adaptation to the more mesic climatic regime of the Late Prehistoric Period, allowing a balanced subsistence pattern.
4) Fissioning of the population as a response to the environmental shift.

The discussion presented offers a plausible, if only partial explanation, for the rapid rise in numbers of Late Prehistoric sites at the close of the Late Archaic Period in the southwestern basins of Wyoming. This is not to say that population was not increasing. However, evidence of bounded territories is not present in the Washakie Basin as it was effectively demonstrated in the Powder River Basin (Eckles 1985). However, there is some evidence of conflict in the Wyoming Basin during the Late Prehistoric Period, Frison (1991:443-444) discusses two finds of pre-Contact burials in the Wyoming Basin that display evidence of warfare. One burial of an adult male exhibited no less than 14 Rose Springs arrowheads within the body cavity or embedded in the bones of the burial. Recovered face down at the bottom of a filled in arroyo , the man's skull also had been crushed by a heavy blow. Another male burial recovered in the Wyoming Basin, not affiliated with the first, yielded an arrowhead embedded in the patella. The calcareous growth around the stone point proved it occurred in an earlier fight, while a crushing blow to the right side of the cranium was the ultimate cause of death. Archaeological evidence of violent conflict prior to European contact is rare in the New World. However, these burials from the Wyoming Basin could be interpreted as suggesting territorial conflict as a result of population growth. As Kelly has pointed out:

> As population density rises, residential mobility would involve the additional cost of displacing a group already using a region. Where resources are dense and return rates high, hunter-gatherers may be very mobile initially; but high per capita return rates could result in rapid population growth that could quickly constrain residential movement (1995:151)

The current refinement of the investigation, both from a theoretical and a pragmatic perspective, limits further clarification.

The effort here also addressed the efficacy of using CRM reports for large scale regional investigations. The feasibility of such investigations has been demonstrated as worthwhile. Such large scale investigations can establish a baseline to provide pattern of settlement and subsistence in which to measure variability on finer scale research. The relative similar levels of occupation between the Late Archaic and the Late Prehistoric Periods display a small dip in population in the Washakie Basin as well as a highly mobile society that continued to maintain a wide territory through direct procurement or social contact with other populations.

It must be borne in mind that archaeology examines the static dregs of a single facet of a once viable whole. Make no mistake, archaeology at its best can only address the preserved fragments of societies long dead and interpret the evidence from two general perspectives, the *sameness* inherit in an assemblage and *differences* in an assemblage. The *sameness* is examined in order to link the data of past behavior with something similar to some understood process while the *differences* are sought to illuminate variations outside of expected patterns of behavior (Torrence 1994:125).

In summary, this dissertation documented the following conclusions:

1) Late Prehistoric populations in the Wamsutter region were more mobile than earlier groups.

2) Increased mobility accounts for, at least, a partial explanation for the rapid increase in numbers of Late Prehistoric radiocarbon dates recorded from the region.

3) The increasing use of bifacial cores, the decline in the occurrence of local material for cores, and some continued evidence of exotic material utilization support the idea that increased mobility accounted for these events.

4) This indicated increase in mobility may be due to the introduction of the bow as well as the diffusion of culture traits and subsistence techniques from the Great Basin. In any case, the increased mobility is evidence of an adaptive shift in response to more mesic environmental conditions at the close of the Late Archaic and the beginning of the Late Prehistoric Periods. The low density of large game may also require high residential mobility.

5) The increase in numbers of grinding stones associated with Late Prehistoric sites suggests greater utilization of the Wamsutter region during the early summer. Estimates of seasonal usage is speculative although the absence of documented storage facilities at any of the recorded sites and the lack of firewood in the region argues against long term occupation of the region during the harsh winters.

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Appendix A

WAMSUTTER LITHIC MATERIALS

1:	Oolitic Chert
2:	Bioclastic Chert (fossill)
3:	Moss Agate
4:	Chert, Black (local)
5:	Chert, Gray(local)
6:	Unknown Chert
7:	Quartzite, Gray
8:	Argellite
9:	Chert, dark brown
10	Chert, White
11:	Chalcedony, Unknown
12:	Quartz, Unknown
13.	Agate
14	Quartzite, Unknown
15	Jasper, Unknown
16	Obsidian
17:	Petrified Wood

Appendix B

DATA AND VARIABLES

A compilation of survey reports funded by Amoco Oil Production, Inc. as part of the Section 106 review process provided the data base. Survey reports from portions of four adjoining townships, two intensive roadway surveys which included Phase II testing of sites recorded within the proposed right of way, and the results of testing of sites located within two proposed pipeline routes which crossed the original survey area. The results of these surveys and testing projects are incorporated in this report . The Wamsutter survey reports are listed below:

Babcock and Frahm 1981	Frahm 1980
Frahm *et al.* 1981	Glover 1980a-c
Glover and Kullen 1980	Glover and Miller 1980
Kiser 1980	Kiser and Kullen 1980
McKay 1980a-d	McKay and Ekeland 1981a&b
K. Miller 1980a-d, 1981a-c	Miller and Winham 1980
Rosenberg 1980a-j, 1981a-f	Schoen 1980a&b, 1981a-c
Smith 1981	D. Steward 1981
Stilphen 1981b&c	Stilphen and Kullen 1981
Vlcek 1979a-h	Vlcek and Lester 1979
Winham 1980a-d, 1981	Winham and Hough 1981a-e

Funded by Amoco Oil Production, Inc., they were to be used as a planning tool to develop the natural gas and oil deposits of the region, following federal guidelines regarding cultural resource management and as administered by the Bureau of Land Management. All data were encoded and, using an IBM PC, a data base created for analysis using the Systat software package. Systat (Wilkinson 1988), a statistical software package, proved to be a very flexible system, allowing variable creation, data analysis and manipulation with little confusion or delay.

The variables recorded during the Wamsutter area survey are listed below. Though most are self explanatory a brief explanation for some variables is necessary. Slope refers to the site aspect as observed in the field, and was divided into eight compass points, north, northeast, east and so on around the compass. A ninth category identified sites located on level areas where the topography did not offer any protection from the environment, i.e. wind. Initially, soil was categorized into nine different types ranging from sand to silty clay loam, but lack of consistency in field identification made these designations unreliable. Thus, the variable was eliminated from analysis.

Prehistoric ceramics were so rarely found that only their presence or absence was noted, though their presence on sites lacking other diagnostic artifacts enabled us to assign them to the Late Prehistoric Period. All ceramic sherd were collected. The presence or absence of fire-cracked rock was also recorded as evidence of hearths even in the absence of other indications. Bone was recorded in a like manner. For the most part, minute carbonized bone fragments found on anthills were the only evidence of possible subsurface deposits.

Classes of various lithic tools were recorded as actual counts except on a few larger sites where the number of such items grew unwieldy in the field. In those instances estimates were made to reflect the preponderance of those tools. Debitage was likewise estimated when the amount grew to levels

Table B.1. Wamsutter Survey Variables

1) Project Locality Number	21) Utilized Flakes
2) Site Identification	22) Hammerstones
3) Provenience	23) Drills/Awls
4) Topography *	24) Manos
5) Slope	25) Milling Slabs
6) Elevation	26) Choppers
7) Soil	27) Abraders
8) Ceramics, P/A	28) Core Tools
9) Hearths	29) Cores
10) Fire-cracked Rock, P/A	30) Other Tools
11) Stone Circles	31) Decortication Flakes
12) Bone, P/A	32) Large Interior Flakes
13) Cultural Period	33) Small Interior Flakes
14) Site Area	34) Bioclastic Chert Tools
15) Projectile Points	35) Oolitic Chert Tools
16) Bifaces	36) Chalcedony Tools
17) Unifaces	37) Quartzite Tools
18) Endscrapers	38) Jasper Tools
19) Sidescrapers	39) Argillite Tools
20) Retouched Flakes	40) Obsidian Tools
	41) Other Lithic Tools

*Topographic Features 1)Deflation Basin ("Blowout"), 2)Stabilized Dune, 3) Unstable Dune, 4) Floodplain, 5) Terrace, 6) Middle Slope, 7) Playa, 8) Hill/Ridgetop, 10) Bench greater than could easily and accurately be counted in the field. The category `Other Tools' refers to the rarer categories of identifiable tools, e.g. spokeshaves, burins, and gravers. Since all materials were identified in the field with a smaller, hopefully, representative sample collected, such unifacial tools are undoubtedly under represented in the analysis. The final variable `Other lithic tools' refers to any tools manufactured of lithic material not previously listed, e.g. basalt, granite, steatite, etc. Tools in this final category were of non-local material.

While the majority of the sites were sampled by the simple expediency of collecting a selection of diagnostic artifacts or lithic material types, those sites reexamined during the course of the road right-of-way surveys and the testing programs for the two pipeline construction routes were intensively recorded. For the road surveys, a hundred percent of all tools and debitage found within the 62 meter right-of-way were flagged, then mapped with a plane table and alidade, and finally labeled and collected. All hearths within the right-of-way were excavated, photographed, and soil samples collected. Most sites recorded during the roadway surveys extended beyond the 62 meter right-of-way and in those cases site boundaries were determined by the distribution of material beyond the right of way, but only features and diagnostic tools were mapped and collected in areas outside the right-of-way (Schoen 1981a). The same, of course, was true for those sites tested for the planned pipeline construction.

Table B.2. Wamsutter Summary Statistics

Artifacts	Number of Sites	Maximum / Site	Mean	Median	Sum
Ceramics	6	--	--	--	
Hearth	286	>200	4.871	2	>1393
Stone Circles	13	10	2.846	2	37
Projectile Points	488	42	2.484	2	1212
Biface	439	26	2.604	2	1143
Uniface	97	>99	2.918	1	>283
End Scraper	135	9	1.43	1	193
Side Scraper	184	11	1.837	1	338
Retouch Flake	186	23	2.565	1	477
Utilized Flake	273	>99	4.527	2	>1236
Hammerstone	57	5	1.526		87
Drills	37	5	1.297		48
Manos	126	6	1.69		213
Metates	81	6	1.44		117
Chopper	81	6	2.383		112
Abrader	5	1	--	--	5
Core Tool	31	9	1.806	1	56
Core	305	60	3.046	2	929
Other Tool	56	11	1.643	1	92

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR 9		1			1						1		UNK	SW
48CR 401	13	4		2	2	2	2	2	1	6	21	1	MALALP	Flat
48CR 727	7	4	1		1			2	1		15		LALP	SW
48CR 802	5	18	1	2	9	11	3	2	3	14	11		MALA	Flat
48CR 819	2	3					3	1		7	4		MA	Flat
48CR 819	9	2					1	1	1	2	1		MALALP	South
48CR 820	11	1			1	5	3	1	1	11	8		LALP	North
48CR 821	7	8	6			7	4	2		1	6		LALP	SW
48CR 823	1	1								1			LA	SW
48CR 827							1				1		UNK	SW
48CR 828		3									2		UNK	West
48CR 830	3	16	3	6	3	3	67	5	2	21	23	2	LA	South
48CR 831	2	3				2	1	1	1	1	3		MALA	SW
48CR 834	2	7					14	1	1	2	6		EA	South
48CR 841	1	1		1	1						1		LA	SW
48CR 930	2									3			UNK	South
48CR 942	1	4			1	1	7						LA	NE
48CR 966	1	1	1			1	5			1			LA	SW
48CR 973	1	2				1	1			1			UNK	South
48CR 974	7	16		1	4	4	25			1			MALA	South
48CR1065					1								UNK	East
48CR1066	3	1			2					4			EA	West
48CR1067		3			1	3		1					UNK	Flat
48CR1068	11	26	2	2	4	16	51	2	2	6	10		PI	East
48CR1069				1				1					UNK	Flat
48CR1071	2			1						2	1		LP	Flat
48CR1072	3										3		MALA	West

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1086	3			1						7	3		LP	South
48CR1100	2	4			1		1			5	4		MA	South
48CR1150	2	1			3			3	2	1			LP	NW
48CR1151											8		UNK	SE
48CR1152											3		UNK	Flat
48CR1164	2	2			1	2				5	2		LP	North
48CR1165	2				2	1				1			LA	NW
48CR1166	1												PI	SE
48CR1175										1			UNK	West
48CR1176	8	3	1	1									LA	East
48CR1176	2	1				1					1		LALP	Flat
48CR1176	3	4		1				2		5			LP	Flat
48CR1176	1	3		1				2		4	2		LP	East
48CR1211		2						1			1		LP	NW
48CR1241	4									1	1		LA	South
48CR1247	2	5				1	3	2		4	4		LA	Flat
48CR1248		3					22		2	19	5		UNK	Flat
48CR1249	2	3									6		MALA	South
48CR1250	4				1		1			1			MALA	South
48CR1250		7			1		1	1		1			UNK	SW
48CR1250		1				3	5			7	1		UNK	West
48CR1250		11		1		4				3	1		UNK	South
48CR1329	5		1					5		4	18		MALALP	SW
48CR1422	3	1											LA	Flat
48CR1435				1									UNK	West
48CR1442			1										UNK	NE
48CR1443										1	2		UNK	South

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1444	1			1									UNK	North
48CR1446													UNK	SE
48CR1447		2		1									UNK	South
48CR1448											4		UNK	South
48CR1449	1					1							LP	North
48CR1451													LP	South
48CR1452	5	13	18	4	5	1	25	1	1		4	1	MALP	NW
48CR1516	1	1			1								LA	South
48CR1517	3	1		1									LP	West
48CR1518	1	2									2		LP	West
48CR1520	5				2					1			LA	South
48CR1521	2	1									5		LP	Flat
48CR1522	2										3		LP	West
48CR1523	1	1											LP	Flat
48CR1524	3									1			LA	West
48CR1525											1		UNK	South
48CR1526	1	1											LP	SE
48CR1527	8	3			1		1	2		1	8		MALALP	South
48CR1528													UNK	East
48CR1529											1		UNK	Flat
48CR1530													UNK	SE
48CR1531	1	2							1				LA	NW
48CR1532	2	1				1				1			UNK	North
48CR1533	1	1									1		LA	North
48CR1534	1												LA	North
48CR1535						1							UNK	South
48CR1537	1	1											LP	East

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1538	1												LA	West
48CR1539	1									1	2		PI	West
48CR1542				1									UNK	South
48CR1542								1	2				UNK	SE
48CR1561	1									2			LA	West
48CR1562				2					2				UNK	South
48CR1564	1										2		LP	SW
48CR1565											1		UNK	West
48CR1578		1											UNK	South
48CR1582													UNK	Flat
48CR1583				1							1		LA	South
48CR1583	11	15	2	5	4	2	17	4	3	16	201	1	MALALP	East
48CR1583	2	4									18		UNK	North
48CR1591	2	1											UNK	West
48CR1592	1												UNK	West
48CR1593						1	1						UNK	NE
48CR1594	1	1											LA	SW
48CR1595	1	2											LA	SW
48CR1596	2										8		MA	South
48CR1597		2			1						15		UNK	SE
48CR1598	3	2			1						1		MALA	NE
48CR1606							1						UNK	NE
48CR1607	2	4									6		LP	SE
48CR1643													UNK	Flat
48CR1644	8	4		1	1			2		3	8		MALALP	North
48CR1646		1	1								1		UNK	West
48CR1647	1	3											LP	South

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1648	5							1			7		LA	North
48CR1649	4		1								4		LALP	South
48CR1651		1	1										UNK	South
48CR1652		2									11		UNK	West
48CR1653		1		1									UNK	NE
48CR1654	3												MALA	NW
48CR1655	1												LP	NW
48CR1656		1											UNK	SW
48CR1657	1												LP	Flat
48CR1658	1	1	2		1	1					1		LP	South
48CR1659													UNK	Flat
48CR1660					1								UNK	SE
48CR1661	1							1			8		UNK	South
48CR1662			1										UNK	SW
48CR1676	3										1		LP	SW
48CR1681	42	21	1	9	2	17	31			1	7	2	MALALP	Flat
48CR1684													UNK	West
48CR1684													UNK	South
48CR1685	1									1	1		EA	South
48CR1686													UNK	SW
48CR1687													UNK	South
48CR1688													UNK	SE
48CR1689													UNK	West
48CR1690	1	2											LA	South
48CR1691													UNK	Flat
48CR1692	2										6		LP	South
48CR1693													UNK	South

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1694	1	1			1						3		UNK	South
48CR1695									1				UNK	West
48CR1696	1										2		LP	South
48CR1697											1		UNK	West
48CR1698		1			1								UNK	SW
48CR1700	2	1	1				1	1			1		MALP	South
48CR1701	2	1											LA	West
48CR1702						1					1		UNK	SW
48CR1703	2	2		2							2		MA	West
48CR1704	2										1		LP	West
48CR1705	1												MA	West
48CR1706	5		1										PI	West
48CR1707													UNK	West
48CR1708													UNK	South
48CR1709	1												UNK	SW
48CR1710	2												LP	South
48CR1711	1	6					1						LP	West
48CR1712	1									1			LA	SW
48CR1713	2												LALP	SW
48CR1714													UNK	SW
48CR1752	3												LA	West
48CR1753	1									3			LA	West
48CR1765													UNK	South
48CR1766	1	1								1	1		UNK	South
48CR1767											1		UNK	South
48CR1768	2										10		LP	South
48CR1771		1									1		UNK	SE

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1772	6	1		1							2	1	LP	South
48CR1773				1							2		UNK	North
48CR1774				1									UNK	North
48CR1775										1			UNK	South
48CR1776		1											UNK	West
48CR1777	2	1					4	4	5		4		MALP	SE
48CR1778		2			1		4	4					UNK	South
48CR1780						1							UNK	East
48CR1781										1			UNK	Flat
48CR1783	4	6	1	1	2			1			2	1	LP	South
48CR1784	2	1		1			1	2	1	2	4		UNK	NW
48CR1785										1			UNK	SW
48CR1786	1	2			1	1	1		1				MA	NE
48CR1787	1	1											UNK	West
48CR1788	3	3			1					5	1		LP	SW
48CR1789	6	8	1	2	6	2	1	1	3	5	107		LALP	SW
48CR1790	2	2		1	1					2	7		MA	West
48CR1791	1					1				1	2		LP	SE
48CR1792	1	2			3	2					4		UNK	SE
48CR1803									1				UNK	West
48CR1807				1		1	1						UNK	West
48CR1807							1						UNK	SW
48CR1809													UNK	East
48CR1810	1	1											LA	East
48CR1811	3	2	2		1						2		LALP	East
48CR1812		1											UNK	South
48CR1813											2		UNK	SW

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1814	1						1						LP	South
48CR1815											1		UNK	South
48CR1816	7	3			2		15			1	1		MA	West
48CR1819		2					1				1		UNK	South
48CR1820	1												LP	South
48CR1821	2					1	2	1		1	1		EA	South
48CR1822	1				1								LA	South
48CR1823							1			1			UNK	West
48CR1824	1										4		UNK	Flat
48CR1841													UNK	South
48CR1842	1					3							UNK	South
48CR1843	1												LP	West
48CR1844		1					1						UNK	West
48CR1845		1					1						UNK	SW
48CR1846	2												LA	SW
48CR1847	1												UNK	SW
48CR1848	1												UNK	West
48CR1849											1		UNK	West
48CR1850													UNK	West
48CR1851													UNK	West
48CR1853													UNK	West
48CR1854													UNK	West
48CR1855		1											UNK	SW
48CR1856											1		UNK	SW
48CR1857	1	1		1			2			5	1		LA	West
48CR1858													UNK	SE
48CR1859													UNK	SW

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1860	5	2											LP	South
48CR1862	1	1					1						LP	West
48CR1863													UNK	North
48CR1864	2	2	1	2			2	4	6	1			LP	NE
48CR1865													UNK	West
48CR1866		3				11	6		1	4	4		UNK	South
48CR1867							1						UNK	West
48CR1868											1		UNK	West
48CR1869		2											UNK	West
48CR1870	1	1	1		1		6						LP	West
48CR1871									1	2			UNK	West
48CR1872											1		UNK	SE
48CR1873	1	1			2					2	2		PI	SW
48CR1874	3	1				1							LALP	SW
48CR1875													UNK	SW
48CR1876	2	2				1	3		1		2		MALP	SW
48CR1877	1	2						1		1	1		LA	SW
48CR1878	1	1							1	1			UNK	SW
48CR1879		1									3		UNK	SE
48CR1880	8	4								3	5		LP	South
48CR1883					1						1		UNK	SW
48CR1884		1											UNK	SW
48CR1886													UNK	East
48CR1887													UNK	East
48CR1888							1						UNK	NE
48CR1889	3	1			4	1		1		3			LA	NE
48CR1890	1	2					3			3			LP	Flat

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1891	8	2	1	1	7	4	7	2	1	1	2		LALP	NE
48CR1892													UNK	NE
48CR1893										1			UNK	Flat
48CR1894				1			4			2			UNK	East
48CR1895	1												UNK	NE
48CR1897		1					5						UNK	NE
48CR1899	1												MA	SW
48CR1900	1	2											LP	SW
48CR1901	1	2								2			UNK	SW
48CR1902	2	1	1	1			1						LA	SE
48CR1903		1											UNK	SW
48CR1903							3			1			UNK	South
48CR1916	1												UNK	North
48CR1917	1	1		1									LA	North
48CR1918													UNK	South
48CR1919							1						UNK	NW
48CR1920											1		UNK	NW
48CR1921	1												UNK	SW
48CR1922	1		4	1	3		1					1	UNK	SW
48CR1923	1										1		LP	South
48CR1924	2												UNK	North
48CR1925	3			1							1		LALP	West
48CR1926									1		1		UNK	East
48CR1927	2	2			1		2				3		LA	South
48CR1928	3		2		2					2	10		MA	SE
48CR1929	3	1			1	4	1	2	2		10		MALA	West
48CR1930		3	2		3						2		UNK	West

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1931					2						2		UNK	West
48CR1933	1	2					1						UNK	Flat
48CR1934	1	1				1						1	MA	Flat
48CR1935	1												UNK	Flat
48CR1936	2	1			1	1							MALP	Flat
48CR1938													UNK	Flat
48CR1939	1	1			2	6	6			1			LA	Flat
48CR1940	2												LA	Flat
48CR1941		1				12	8	1					UNK	Flat
48CR1942	1					5	13			1			UNK	Flat
48CR1943		1											UNK	NE
48CR1944										1			UNK	North
48CR1945	2				1				1				UNK	North
48CR1946	4	2		1	2	2				1			LA	Flat
48CR1946	11	1				2		2		3	3		MALA	North
48CR1947	1	8			4	1				1	3		UNK	South
48CR1948							1						UNK	Flat
48CR1949							1			2			UNK	Flat
48CR1950	1												LA	North
48CR1950	2												LA	West
48CR1950	2	5	1		1			2		1	17		MALP	South
48CR1952	1	1				1							MA	SW
48CR1956		1											UNK	SE
48CR1963	1												MA	NE
48CR1964	5	3	3			2	3			2			MALA	NE
48CR1965		1	1					1		3			UNK	SW
48CR1966					1								UNK	South

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1967	1	3						1		3			UNK	NW
48CR1969													UNK	Flat
48CR1970										1			UNK	NE
48CR1971	2	2					1			2			LA	North
48CR1973						1				1			UNK	Flat
48CR1974	7	4	2	1	1			1		61	19		LALP	South
48CR1977	1	1											UNK	North
48CR1978	2	2	5							7			EA	SE
48CR1979	3	4	3		1					1			MALA	SE
48CR1980										2	1		UNK	NE
48CR1981	1												PI	SE
48CR1982	2	2	2								1		LALP	West
48CR1983		3					2						UNK	West
48CR1984	2		1										MA	West
48CR1985							2						UNK	North
48CR1986											6		MA	North
48CR1987	2	2	1				2	6	1	12	41		MA	Flat
48CR1988	1												UNK	East
48CR1989	1		1										LA	West
48CR1990	5	1					1			1	6	1	MALP	SW
48CR1991							1			1			LA	West
48CR1992	1	3		2		2	5			1			MALA	West
48CR1993	1	1			1					1			MA	NE
48CR1994	1	2											LP	Flat
48CR1995	3										2		MA	Flat
48CR1996						1							UNK	Flat
48CR1997													UNK	West

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR1998	2	2					1			1			MA	West
48CR1999	1					1				1			LA	South
48CR2001	1		1									1	UNK	West
48CR2002		1		1						1			UNK	NW
48CR2003							1						UNK	NW
48CR2004	1												UNK	North
48CR2006										2			UNK	West
48CR2008		2	1				1			1	3		UNK	SE
48CR2009	1							1			2		UNK	SE
48CR2010											2		UNK	SE
48CR2012		1		1		2	3						UNK	South
48CR2013	2				2		5			6	8		LA	South
48CR2015			1		2	2				1			PI	South
48CR2017	3	1			1	2	1			4	9		LA	South
48CR2019										2			UNK	South
48CR2020	3				3		3			1	3		LP	SW
48CR2021	2	1		1	3		7				8		LA	East
48CR2022	5	13		2	1	1		2					MALALP	Flat
48CR2023	1				2		1				7		UNK	East
48CR2024	1									1	5		LA	Flat
48CR2025	1							1		1	2		LA	Flat
48CR2029					1					1			UNK	West
48CR2030	2	2									2		MA	West
48CR2032	1	1											UNK	NE
48CR2033	1						1	1			9		MA	NE
48CR2034	1					1					2		MA	East
48CR2035	1				1		1				6		LA	NE

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR2036	1	1									1		LA	North
48CR2038	1			1									LA	NE
48CR2039	7	4			2	1	3				9		MALA	North
48CR2040	4	15			4		2			4	15		MALA	North
48CR2041											1		LP	West
48CR2042	1						1						LP	North
48CR2043	1						1						LP	West
48CR2044	3	1	1		2					1			MA	West
48CR2045	4	2											LP	South
48CR2046	1												LA	South
48CR2047	1			1									LA	SW
48CR2048		1											UNK	West
48CR2049													UNK	South
48CR2050	1												LP	SW
48CR2051													UNK	South
48CR2052	2												LP	SW
48CR2063	1												UNK	SW
48CR2103	4			2					1	1	1		LA	Flat
48CR2104											1		UNK	Flat
48CR2105									1				UNK	Flat
48CR2106								1	1		1		UNK	Flat
48CR2107		1				1							UNK	Flat
48CR2108	1			1			1			1	2		LP	South
48CR2109	1					1					3		MA	Flat
48CR2110	1	2							1				UNK	Flat
48CR2111		1	1	1					1		5		UNK	Flat
48CR2112		1				1							UNK	Flat

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR2114	2										1		EA	Flat
48CR2115	4	1					1	2			4		LA	Flat
48CR2116	1										1		UNK	Flat
48CR2117	2												LA	Flat
48CR2121	1	2				1							MA	East
48CR2122	2												MA	SW
48CR2123	4				1	2				1			MA	West
48CR2124	1	1					5						LP	SW
48CR2125	2	2		1		4	5	1				1	LA	SW
48CR2126	2	1				5				3			LA	Flat
48CR2128	3		1	1		3							LA	East
48CR2128	3		1	1		3							LA	East
48CR2129													UNK	East
48CR2130	1	2		2		2	3						LA	SE
48CR2131	1					1	2						LA	South
48CR2132		1		1		2							UNK	West
48CR2133	2	1				2						2	LP	Flat
48CR2134	2											1	UNK	NW
48CR2135	1												LP	NW
48CR2136	2												LA	SW
48CR2138					1		3						UNK	SW
48CR2139	1												LA	SW
48CR2140	1	1					22			2	1		LA	NW
48CR2144										1			UNK	SW
48CR2145													UNK	South
48CR2147										1			UNK	West
48CR2148													UNK	West

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR2149	2												MA	West
48CR2150	2	3	1		2	5	1	2	1	4		1	MALA	North
48CR2151		1						1					UNK	South
48CR2152	1	1							1	1			UNK	South
48CR2153	3	4							1	1			LALP	East
48CR2154		1							1	1			UNK	North
48CR2156									1		1		UNK	SW
48CR2157	1								1		2		LA	East
48CR2164	1									1	3		UNK	North
48CR2191	19	21		2	11		18	5	2	22	8	1	MALALP	South
48CR2191	19	12	1	2	1		18	5	2	22	8	1	MALALP	South
48CR2224	6	5		2	3	1		1		3		1	MALP	South
48CR2225	7	6		1	1	1		3	1		26		MALALP	SE
48CR2226					1								UNK	SW
48CR2227		1											UNK	West
48CR2228	1	5		2	1					1	1		UNK	West
48CR2229	1				1						1		UNK	West
48CR2230		1			1	1				1			UNK	North
48CR2231	4	3		1				1			1		EA	West
48CR2232	2												MA	SW
48CR2234	2			1						1	1		LP	South
48CR2236	3									3			MALA	North
48CR2237		1											UNK	South
48CR2238													UNK	Flat
48CR2241	3									1	1		EA	South
48CR2721					3					3			UNK	Flat
48CR2723		1											UNK	West

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR2725		7	99		3				1	1	6		UNK	South
48CR2726	1			1			3						MA	South
48CR2727		1	1		1	1				2		2	UNK	SW
48CR2728							2			3			UNK	SW
48CR2729	1									1			LP	SW
48CR2730	1	1						1					MA	SW
48CR2731	6	2	3	1			6						MALA	SE
48CR2746	3			1			26			1			LA	South
48CR2752	1				1					4			LP	South
48CR2753				1						3	1		UNK	SW
48CR2754		1											UNK	SW
48CR2755	1	2				3	1			1			LA	SW
48CR2756	2	3				1				4			LA	SW
48CR2757	1												UNK	SW
48CR2758													UNK	SW
48CR2759	5	3	1				1	2	1	5	6		MALA	SW
48CR2760	1					1							LA	SW
48CR2761	4	7	1	4	1			1		3	13		MA	SW
48CR2762	3					1	1			5	2		LALP	SW
48CR2763		3								5	2		UNK	SW
48CR2764	1	1											LA	SW
48CR2765							1						UNK	SW
48CR2766		2					1			3	1		UNK	SW
48CR2767													UNK	SW
48CR2768										1			UNK	SW
48CR2769	2	1								1			LP	SW
48CR2770	5	6			2	1				1	1		MALA	SW

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR2771	1	1			1	2				3			LA	SW
48CR2773										1			UNK	SW
48CR2774													UNK	SW
48CR2775	1												LA	SW
48CR2776	2	1											LP	SW
48CR2777	1	1			1					7			UNK	SW
48CR2778	5	2			2								MALA	SW
48CR2779	4	1								4			MALA	SW
48CR2780	1	4			2	3				14	1	1	UNK	SW
48CR2832	7		1		1	1				1	4		LA	West
48CR2833	1									2	2		UNK	SW
48CR2835											1		UNK	South
48CR2836													UNK	West
48CR2837					1	2				1	2		UNK	East
48CR2838	1						1				4		LA	SW
48CR2839	2	1				1				1	1		LA	South
48CR2840		1								1	1		UNK	SE
48CR2841	6			1	2	1				1	5		LALP	South
48CR2842	1				1								UNK	South
48CR2843	1						2		1				UNK	East
48CR2844	4			1			1				2		LALP	Flat
48CR2845	1	2		1						1	1		LA	SE
48CR2850		1							1	3			UNK	NE
48CR2851			1							1			UNK	West
48CR2852	3	1	1				1	1	1	2	7		LALP	West
48CR2853	1	1	2	1	1				2	7	2		UNK	West
48CR2854											1		UNK	West

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR2855											1		UNK	West
48CR2856	1	2				1	1			3	1		UNK	West
48CR2857	1				2	1							LP	West
48CR2858		4					1						UNK	West
48CR2863	2	1				1			1		2		LA	West
48CR2864	2	2		2		1				1			LA	North
48CR2865	1												LA	North
48CR2866		2						1		1	1		UNK	NW
48CR2867						1							UNK	NW
48CR2868											1		UNK	North
48CR2870				1	1								UNK	North
48CR2871							1			1			UNK	North
48CR2872	4	2		2	1						1	1	MALA	West
48CR2873	2	3				2		1	2	2	6		LALP	Flat
48CR2874		1								2	1		UNK	West
48CR2875	2	1								1			LP	West
48CR2876	1	1	1	1				1	1	1			LP	West
48CR2877							1						UNK	SW
48CR2878	1	2					1			2	1		LA	North
48CR2879						3	1						UNK	North
48CR2880													UNK	North
48CR2881						1					1		UNK	South
48CR2882													UNK	South
48CR2883	3	1		1	1								LA	West
48CR2884							1				1		UNK	West
48CR2885		1					2				1		UNK	South
48CR2886		2								1	1		UNK	South

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR2887	3	2			1	1			1	3	20		MALP	South
48CR2888													UNK	West
48CR2889	1	1								3			LA	West
48CR2890	1			1									UNK	South
48CR2891		2											UNK	Flat
48CR2892	4	6		1	1					1			MALA	West
48CR2893	1	2				1				2	2		LA	Flat
48CR2894	1	2					1			3			LA	North
48CR2896									1				UNK	Flat
48CR2897	2	1						1		1		2	LA	West
48CR2898		1					1	3	1		1		UNK	West
48CR2899	3	7		1	1	1		2	1	7	3	2	MALA	NW
48CR2900	1									1			UNK	North
48CR2901	1												LP	West
48CR2902						2							UNK	West
48CR2903	1					1	1						UNK	West
48CR2904	1						1	1					LP	West
48CR2905	2	4		3	2	2	2	2	1	4	2		LALP	West
48CR2906	5	5	1	1		3	1			4	2	1	MALA	SW
48CR2907		1		1	2		1			1	2		UNK	NW
48CR2908	3	2	1							1	1		LA	West
48CR2909													UNK	West
48CR2910	2									1	1		LP	West
48CR2911	1										1		PI	West
48CR2912								1			1		UNK	West
48CR2913		1			1		1						UNK	West
48CR2922	5	4	3				1	2	2	1	4		LALP	South

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR2923		4		1	1	5	1				1		UNK	West
48CR2924											1		UNK	West
48CR2925			1				1				1		UNK	SE
48CR2926	3	1		1			1						LALP	NW
48CR2927		1									3		UNK	SW
48CR2929	1		1								4		LP	SW
48CR2930	7	2						2	1		57		MALALP	Flat
48CR2931	1	1									5		LP	West
48CR2932		2								1	1		UNK	West
48CR2947	5	1			2					1			LA	North
48CR2948	2	4						3					LP	South
48CR2949							1						UNK	South
48CR2950													UNK	East
48CR2951	1			1			1						UNK	Flat
48CR2952		3				1					1		UNK	South
48CR2953		1											UNK	East
48CR2955													UNK	NW
48CR2956	1	1					2						LA	East
48CR2957							2						UNK	NE
48CR2958		1											UNK	South
48CR2959	2						7	1			1		LALP	East
48CR2960		1				1				2			UNK	SW
48CR2962				1						1			UNK	South
48CR2963		3					3				2	5	UNK	SW
48CR2987						1							UNK	NW
48CR2988							3						UNK	West
48CR2989													UNK	NW

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR2991	1						8						LA	East
48CR2992				1			2						UNK	North
48CR2993										1			UNK	West
48CR2994													UNK	Flat
48CR2995		1											UNK	North
48CR2996													UNK	NE
48CR2997													UNK	NE
48CR2999	7	7	1		2		3	5		8	4		MALALP	NE
48CR3001	2	1					3	3		4			LA	SE
48CR3003		1					1						UNK	West
48CR3004							1						UNK	West
48CR3005			1										UNK	West
48CR3006	1												MA	West
48CR3007	1	1		1			1			1			LA	NW
48CR3008	2			1					1				LP	NW
48CR3009													UNK	NW
48CR3010			1				1	1	1				UNK	South
48CR3011	2	3				2		2		6			LALP	East
48CR3012	4	2	1			2	3	1		3			MALALP	South
48CR3013		1					1						UNK	NW
48CR3014	1	1		1	1			1	2	1			LP	NW
48CR3015	2						1						MALA	West
48CR3016	3	2		1	1	1		1		1		1	LA	West
48CR3017	1	1					2	1		3		2	MA	West
48CR3018						1	1						UNK	South
48CR3019		2											UNK	NW
48CR3020						1				1			UNK	NW

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR3021										1			UNK	West
48CR3022							1						UNK	West
48CR3023						3							UNK	NW
48CR3024								1					UNK	NW
48CR3026										4	1		UNK	East
48CR3027	1					3	2						UNK	West
48CR3029	2	1				1	2		1		1	1	LP	West
48CR3030	2					1							LA	West
48CR3032	2	1		1			1			1			LALP	NW
48CR3033	2					4			1	1			UNK	North
48CR3034	1	2			1								MA	North
48CR3035		1				1				2			UNK	Flat
48CR3036	1	5				1				1			MA	North
48CR3037		1				1							UNK	NE
48CR3038		1											UNK	East
48CR3039	1						1	1					LP	East
48CR3040	1						1						UNK	South
48CR3041		1				1	3				1		UNK	SW
48CR3042	1	1			2		2			1			LP	South
48CR3043						1				1			UNK	South
48CR3044		2				5				1	1		UNK	SW
48CR3045	1					1							LA	Flat
48CR3046		6											UNK	South
48CR3047		1											UNK	Flat
48CR3048		2			2	2	1						UNK	NW
48CR3050	1	3			1		2			4		1	UNK	East
48CR3051	1												UNK	SW

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR3052	1												UNK	Flat
48CR3053	1	1			1								LA	NE
48CR3054										1			UNK	NE
48CR3055	1			2		2							MA	SW
48CR3056	2				1		1						LP	East
48CR3057	1	2		1			2			1			LA	NE
48CR3059		1								1			UNK	SW
48CR3060		1											UNK	Flat
48CR3061		1						1		1			UNK	SW
48CR3062													UNK	SW
48CR3063		1				3				1			UNK	Flat
48CR3064						1							UNK	SW
48CR3065	1	1											UNK	Flat
48CR3066	6	3		1		2	2			2		1	LA	SW
48CR3066		1											UNK	SW
48CR3096	3	1					2	1		4			LA	West
48CR3096							2						UNK	West
48CR3097		1						1					UNK	West
48CR3098	5	12			3		4	1	1	2	14		LA	West
48CR3098	1												PI	West
48CR3099		1											UNK	West
48CR3100										1			UNK	Flat
48CR3101	1						5			2			LP	West
48CR3102		2				2	2	1	2				UNK	West
48CR3103							1						UNK	Flat
48CR3104							2						UNK	Flat
48CR3105	1						1						MA	Flat

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR3106	1	1											UNK	Flat
48CR3107													UNK	Flat
48CR3108							1						UNK	Flat
48CR3109					1								UNK	Flat
48CR3110							2						UNK	Flat
48CR3114													UNK	Flat
48CR3115	1	1								1			UNK	NE
48CR3116											1		UNK	NE
48CR3117										1			UNK	NE
48CR3118	4	4					1	2	6	1			MALA	South
48CR3119		6	1	1			6	2		5			UNK	Flat
48CR3120													UNK	Flat
48CR3121		1											UNK	North
48CR3122	3						4	1		1			MA	North
48CR3123							2	1	1				UNK	West
48CR3124	2	4				1	6	1	1	1			LA	South
48CR3126	7	3				2		1		2	2	1	PI	West
48CR3127										1			UNK	Flat
48CR3128	1		2		1		1	1					LP	East
48CR3129							1			1			UNK	East
48CR3130	1	1					1						UNK	East
48CR3131	1				1		2			1			LP	East
48CR3132					2			1		2			LP	East
48CR3133	13	14	2	7	9	23	9			9	1		LA	Flat
48CR3134		2				2							UNK	SE
48CR3136		1		1	3	1	1			2			UNK	East
48CR3138	1	3					24	3		4			UNK	East

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR3139	1	16		2			99	3		6	1		MA	South
48CR3142	1	1					2			1			LP	SE
48CR3143		1		1			21						UNK	SW
48CR3144	3				2		2						LA	SW
48CR3145	1	1		1						1	3		UNK	SW
48CR3146							4						UNK	SW
48CR3147							3						UNK	SW
48CR3147													UNK	SW
48CR3148	1						14						LP	Flat
48CR3149		2					4			1			UNK	Flat
48CR3150	1						1						LP	NE
48CR3151		1		1			1			1	1		UNK	SW
48CR3152							1						UNK	North
48CR3153	1	1					11			9			LP	SW
48CR3154	2	2					1						MA	SW
48CR3154							1						UNK	SW
48CR3155		1				1	2						UNK	South
48CR3156													UNK	South
48CR3224		1											UNK	Flat
48CR3225	1	3					2				1		UNK	Flat
48CR3226													UNK	Flat
48CR3227	4	6			1		4			5	1		MA	SE
48CR3228							1				1		UNK	NE
48CR3229													UNK	NE
48CR3230		2					1			1			UNK	Flat
48CR3231	2					1							PI	Flat
48CR3232	1	2					7			1	1		UNK	Flat

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR3235							1			1			UNK	South
48CR3236		1					3			2			UNK	South
48CR3237		2					1						UNK	South
48CR3238		1					2			3			UNK	South
48CR3239							2						UNK	South
48CR3240		1					1						UNK	South
48CR3241	1					1							UNK	South
48CR3242						1	2						UNK	South
48CR3243		1							1				UNK	South
48CR3244							2						UNK	South
48CR3245	2	1					4		1	1			LA	North
48CR3247	1	1					2					1	LA	North
48CR3248							2						UNK	North
48CR3249		2					1						UNK	North
48CR3250													UNK	West
48CR3251					1					1	1		LALP	West
48CR3252		1					1			1			UNK	NW
48CR3254					1								UNK	SW
48CR3255										2			UNK	NE
48CR3256	1	4		1						4	3		LA	NE
48CR3257	2	12			3	2	8	3		11	2		LALP	South
48CR3258		2								2			UNK	SW
48CR3259										1			UNK	SW
48CR3260										2			LA	SW
48CR3261		1											UNK	West
48CR3262													UNK	West
48CR3263		2				1							UNK	West

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR3264					1	2							UNK	SW
48CR3265	1	1	3	2		4	2			6			UNK	South
48CR3266	1	1	3	1	1	6	5			9			LALP	North
48CR3267	2	1											LP	Flat
48CR3268		1											UNK	South
48CR3269	6	7	12	2		12		1		12	2		LA	South
48CR3269	2	2	6	1	3			3		3	7		LA	North
48CR3269	1	1								5		1	MA	North
48CR3269		4				3				9			UNK	West
48CR3269	1	2				3				6			UNK	West
48CR3271	2	1	1		1	2	1	1		1			MA	SW
48CR3272							1						UNK	East
48CR3289	8	4	2	2	6		4			4	1		MALA	East
48CR3290		1	1							1			UNK	Flat
48CR3290		2					1						UNK	SW
48CR3291		2	1		1	1	1						UNK	Flat
48CR3293	1				1								UNK	Flat
48CR3294							1			1			UNK	SW
48CR3295													UNK	SW
48CR3296			1							1			UNK	Flat
48CR3297													UNK	Flat
48CR3298		1								2			UNK	NW
48CR3299						1	1			2			UNK	West
48CR3300		1			1		1			5	1		UNK	West
48CR3301													UNK	NW
48CR3302	1					1				3			EA	West
48CR3303						1	1						UNK	West

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR3304		1			1						1		UNK	NW
48CR3305						1				1			UNK	West
48CR3306							1						UNK	North
48CR3307	1	4			1		2			5			MA	North
48CR3308	2	2	1			1	1			3			LP	West
48CR3309							1						UNK	West
48CR3311	2	4	6	1	1		26			3	3		LP	SW
48CR3312	2	1			2		5			4			LA	Flat
48CR3313							1	1					UNK	South
48CR3314													UNK	SW
48CR3315	4				2		2			1			PI	East
48CR3316	1												LP	North
48CR3326	2										1		LP	NE
48CR3327						2							UNK	Flat
48CR3328													UNK	East
48CR3329	1	6		2	3	8	6	1		4			LA	NE
48CR3330		2											UNK	East
48CR3331	2	2						1					MALA	NE
48CR3332	2	1	3	1	2	1				2	1		UNK	NE
48CR3333		1			1			2		1			UNK	NE
48CR3335	1	2				1				1			LA	NE
48CR3336				1			5						UNK	SW
48CR3337	2				1		1			1			LA	SW
48CR3339	4	2	8	1	8		51			33	1		MALA	SW
48CR3340							1			1			UNK	SW
48CR3341	2	2		1			2			5	1		MA	NE
48CR3342			1				1			1			UNK	NE

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR3343	2			1									MA	North
48CR3344	1	1											LA	SE
48CR3345	1	1											EA	NE
48CR3346	2	2					1						LA	West
48CR3347	3				2	2				2	9		EA	Flat
48CR3348													UNK	West
48CR3349	5	4	1							4			LP	Flat
48CR3350			1										UNK	NW
48CR3351	2	1											MA	SW
48CR3352	1	1			1		1	1		1			LP	East
48CR3353	4	3	2				1				1		LALP	South
48CR3355	1												UNK	SE
48CR3356	1				1								LA	NE
48CR3357	2		1		2	4				2			LALP	NE
48CR3358	1	2								2			LP	SE
48CR3359		1		3	2	1				2			UNK	East
48CR3360	1	2			1		4	1		3	1		MA	Flat
48CR3362	2	8			1		1			4			EA	NE
48CR3363						1	2	1					UNK	South
48CR3364		1								2			UNK	SW
48CR3365													UNK	South
48CR3366	2									1			LP	SW
48CR3367													UNK	SW
48CR3368	1	2				1	2		1				PI	SW
48CR3369							1						UNK	SW
48CR3370	1												UNK	West
48CR3371		1				1				1			UNK	SW

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR3372		1	1	1		1	1			1			UNK	South
48CR3373	1	2			1					9			LP	South
48CR3374					1		1						UNK	SW
48CR3375	1			1		1	1		1	1			MA	South
48CR3376	5					1		1		3			LA	East
48CR3377		2				1							UNK	South
48CR3378		3	1	1			1			4			UNK	East
48CR3379		2											UNK	West
48CR3381													UNK	West
48CR3382										1			UNK	SW
48CR3383							3			1			UNK	SW
48CR3384						2	2						UNK	SW
48CR3385								1					UNK	SW
48CR3386													UNK	North
48CR3387	1												LP	South
48CR3388	2				1			2				1	LP	SW
48CR3389	1									1			LA	SW
48CR3391													UNK	SW
48CR3392		2	3							2			UNK	NW
48CR3393													UNK	NW
48CR3395	1										1		LA	South
48CR3397		1											UNK	SW
48CR3398										2			UNK	SW
48CR3399					2					2	1		UNK	West
48CR3400				1				1					UNK	SW
48CR3401	1												LA	NE
48CR3405	3						2	1		3	20	1	MALALP	West

Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48CR3407	3	3		1			1	1				1	LP	NW
48CR3410					1					1			UNK	West
48CR3411	4	1				2	1				4		LP	SE
48CR3412							2			1	1		UNK	NW
48CR3414	9	3		2	1		4	2		3	1		LALP	West
48CR3415										1	1		UNK	North
48CR3416	1												UNK	West
48CR3417													UNK	SW
48CR3418		1								1	2		UNK	NW
48CR3419	2	2				1	1		2	1			LA	West
48CR3420		1				1							UNK	North
48CR3421	2					1							UNK	North
48CR3422	1									1	5		UNK	West
48CR3423	3		1		1								UNK	West
48CR3424	6	4	1	1				2	1	4	1		LALP	NE
48CR3425													UNK	North
48CR3494		1					2		1				UNK	SW
48CR3495	1	2				15					13		LP	West
48CR942	8				1		1	3	1	3	4		LA	NE
48SW 677		1			2								UNK	NE
48SW 678	1												LP	West
48SW 679	2												LP	SW
48SW 878		1			2					1	1		UNK	West
48SW1059	2				1	1							UNK	SW
48SW1078	1	1											UNK	South
48SW1162		1											UNK	East
48SW1163											1		UNK	SE

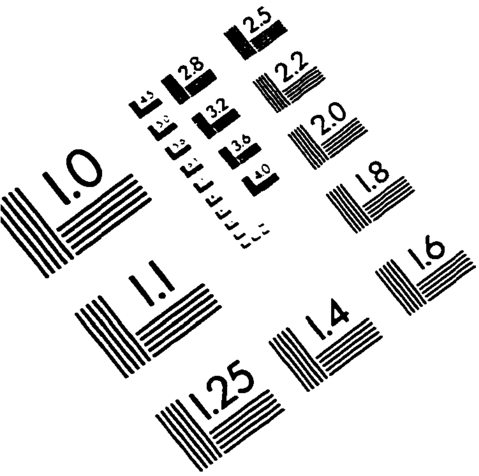
Table C.1. Wamsutter Survey Data

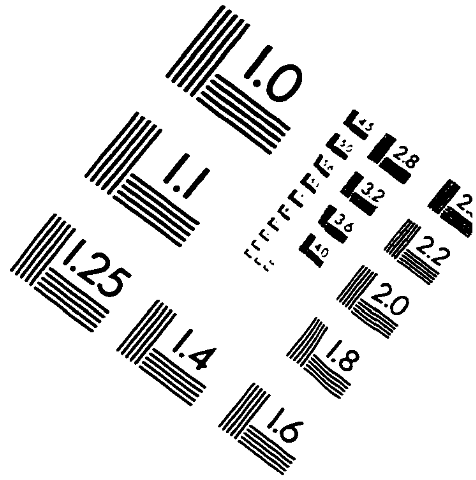
Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48SW1164	1	2			1						1		LA	East
48SW1165		1				3							UNK	SW
48SW1209													UNK	North
48SW1210		1									2		UNK	South
48SW1220	1												UNK	NW
48SW1221		2											UNK	South
48SW1688	6	7			3			1			8		MALALP	East
48SW1732		2					2	1					UNK	NW
48SW1733		2			1								UNK	West
48SW1862													UNK	West
48SW1873	2	3			2	2				1	4		LP	South
48SW1895	2												LP	NW
48SW1896		1				1							UNK	SE
48SW1897	1	3								1			LA	South
48SW1898	1	8	1	1		2			2	25	2		MA	South
48SW1900	2	5		1		2				1	1		LP	South
48SW1918	3	4			3						3	1	LP	South
48SW1919											4		UNK	South
48SW1920		1											UNK	South
48SW1921	2	1											LP	South
48SW1922	1	1			1								LP	Flat
48SW1923													UNK	South
48SW1924	1	2		1									UNK	South
48SW1925		1								1			UNK	SE
48SW1926	1				1						2		LP	SW
48SW1927		1			1								UNK	SE
48SW1930	1	2									1		PI	South

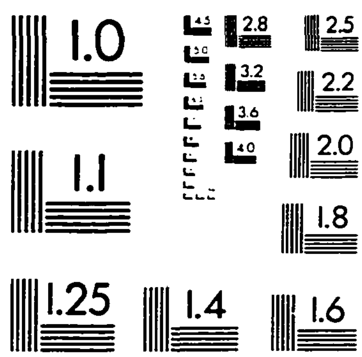
Table C.1. Wamsutter Survey Data

Site	PP	Biface	Uniface	End	Side	Retouch	Utilized	Mano	Metate	Cores	Hearth	Drill	Age	Slope
48SW1930	1	1		1	2	1							PI	West
48SW1930	7	2		2	5					1			PI	West
48SW1930	4	6	1	1	2						3		PI	SW
48SW1930		1									2		UNK	SW
48SW1930	1	1	1										UNK	South
48SW1930	1	2		1	1					1			UNK	North
48SW1931	4	12	1		3	6				4	7		LP	SW
48SW1937	1												UNK	SW
48SW1938				1							1		UNK	NW
48SW1939	1	1											UNK	South
48SW1940	2	1								1	7		MA	South
48SW1941						4							UNK	North
48SW1948													LALP	SE
48SW1949											1		UNK	SW
48SW1951	1	1								1	1		UNK	SW
48SW1952		1											UNK	South
48SW1953		1									1		UNK	SE
48SW1954		3					1	1					UNK	South
48SW1956	1										1		LP	North

IMAGE EVALUATION
TEST TARGET (QA-3)







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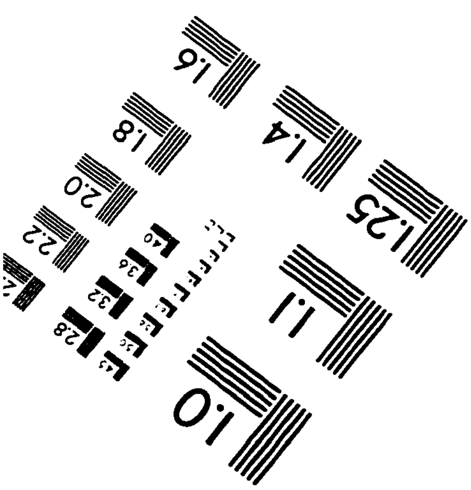

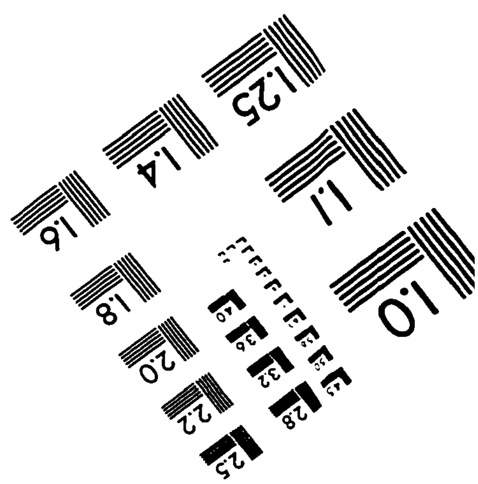

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