

Southeastern Montana in the Late Prehistoric Period:  
Human Adaptation and Projectile Point Chronology

by

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## ABSTRACT

A central goal of this thesis is to provide a framework for explaining adaptive strategies and artifact histories of the Late Prehistoric Period I (A.D. 250-1000) and II (A.D. 1000-1700) in the Pine Breaks of southeast Montana.

The method by which this is achieved involves the identification and clarification of the expanded flake point tradition through, in part, a survey of the literature and through the exploration of evidence from excavated sites and survey inventory sites, many of which are not yet fully published.

Present archaeological evidence suggests that hunting, lithic procurement, population density, and settlement systems of the Pine Breaks area were somewhat different from those of the open plains. The Pine Breaks, an ecologically distinct area within the Northwestern Plains, provides many attributes for human occupation that the open plains do not. The Period I Benson's Butte-Beehive complex represents an adaptation to the Pine Breaks. It is characterized by Avonlea-like points, high fortifiable living locations and circular rock-walled dwelling structures. Benson's Butte, one of the type sites of this complex, also yielded evidence of a point manufacturing technique which utilizes a distinct expanding flake. It is hypothesized that use of the expanding flake forms the basis of the fabrication process for most of all Late Prehistoric small side-notched arrow points. Based on this manufacturing tradition, it follows that triangular unnotched forms or "points" are rarely used as projectile tips, but as preforms for the notched points of the Late Prehistoric period. Although identified in the Pine Breaks area, this refinement of projectile point

chronology is applicable to the Northwestern Plains and possibly other areas of North America.

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## Chapter 1.

### INTRODUCTION

In the early 1970's the exploitation of western coal in Montana and Wyoming began simultaneously with the maturing of the "environmental movement". Legislation and an increased public awareness focused attention on cultural resources, both prehistoric and historic. Since southeastern Montana contains great quantities of low sulphur, sub-bituminous coal beds 30-40 m thick and close to the surface, strip mines were planned as the most economical means of recovering this coal. Federal and state laws require that cultural resource inventories be conducted on all lands that are affected by these massive undertakings. Federal agencies, in order to understand the resource, conducted "in house" inventories on lands administered primarily by the United States Forest Service and the Bureau of Land Management (BLM). The combined agency and company sponsored survey and excavation work produced considerable quantities of information in a relatively short period of time. Until 1970 no archaeological surveys had been conducted and few sites reported, much less excavated. A decade later approximately 120,000 acres (48,500 hectares) have been inventoried intensively and an additional 80,000 acres (32,375 hectares) have been selectively examined.

As the rush to inventory these lands began, numerous problems arose. These were associated with methodology, comprehension and interpretation of federal and state legislation, evaluation of the significance of sites, cultural/temporal association of the sites, and the function or activities which caused the archaeological remains to be deposited at a given location.

Much of the difficulty centered around a primary problem, a general lack of archaeological knowledge about the Northwestern Plains, particularly southeastern Montana. The paucity of data on the Northwestern Plains in general is illustrated by Gordon Willey in his 480 page tome, An Introduction of American Prehistory: North and Middle America. In it the prehistory of the Northwestern Plains, an area of approximately 1,800,000 km<sup>2</sup> is covered in less than two pages (Willey 1966:311-320).

For the Plains the attention of both the profession and the public alike has focused on the Wonderful World of Early Man ... the Early Man Plains Big Game Hunters receive a great deal of attention but the rest of Plains Prehistory is summarily dealt with.. (Reeves 1970:10).

The Northwestern Plains are conceived of as the lands of short grass prairie to the east of the Rocky Mountains (Figure 1). The aspen parklands border on the north and the North Platte River is near the border on the south. Within the Northwestern Plains are geographic areas which present contrasts to the large expanses of shortgrass prairie. One of these is a triangle of semi-mountainous, partially forested lands leading from the Rocky Mountains to the Black Hills of South Dakota. This area is termed the Pine Breaks for purposes of discussion. Comparatively, the Northwestern Plains are a relatively flat sea of grass dissected by dendritic drainage systems (e.g., Missouri River, Milk River, Old Man River) and small outlier mountains ranges (e.g., Bearpaws, Cypress Hills, Little Rockies) which provide occasional topographic and ecological diversification. The Pine Breaks are generally viewed as part of the plains, but they are ecologically distinct because of the number of relatively diverse environments they contain. Ecological changes are more subtle than the change from plains to mountains, or plains to river valleys. It is contended here that the Pine

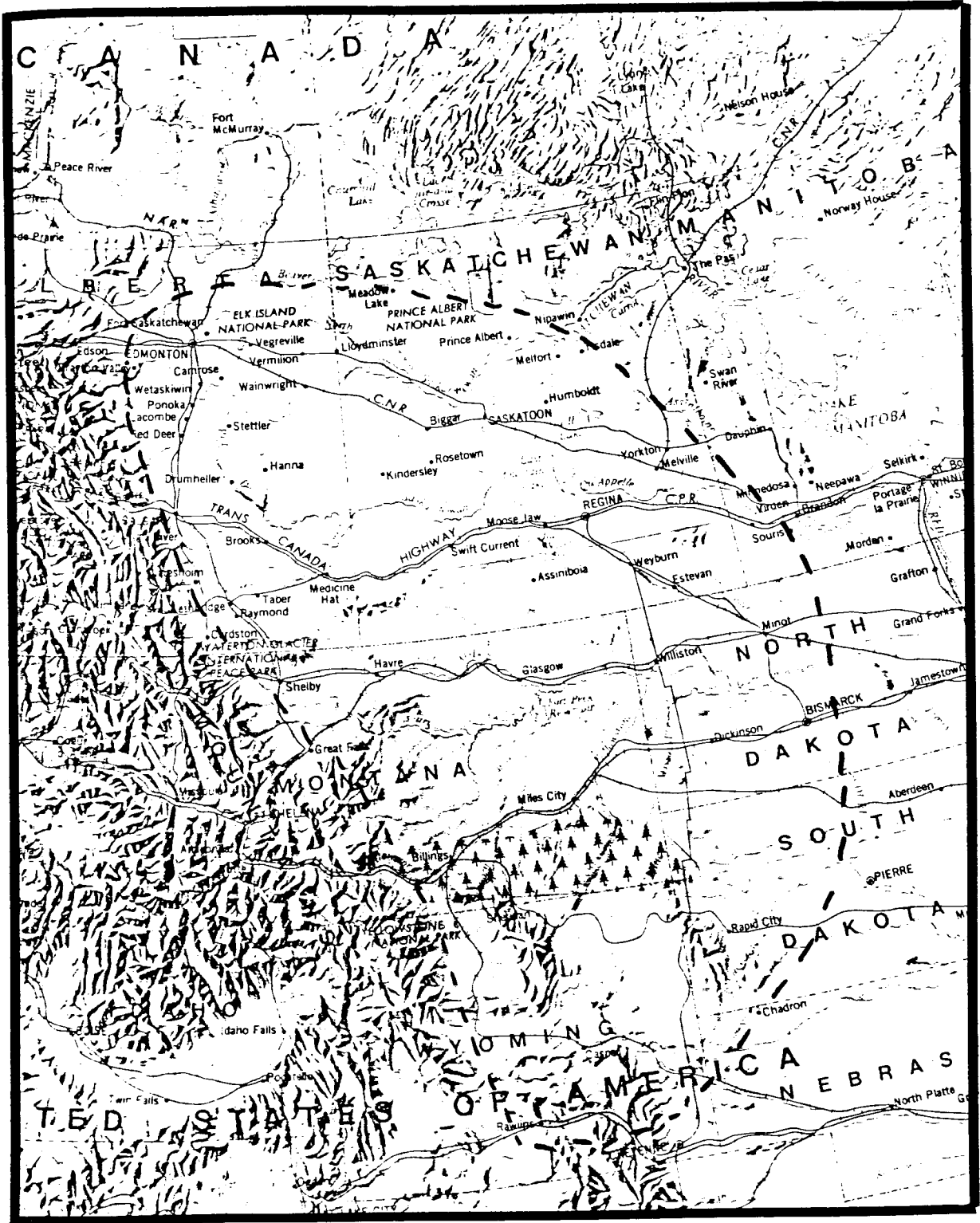


Figure 1. Map showing the Northwestern Plains (defined by dashed line) and the Pine Breaks area (defined by the pattern). (Base map from The Government of Alberta and the University of Alberta, Edmonton 1969:1)

Breaks provide many advantages to human populations over a true open Plains environment. For the last 10,000 years the human economic base on the Northwestern Plains has been, in varying degrees of dependence, on forms of Bison sp. Of concern here is the technological and hunting strategies employed by the resident populations of groups classified as "hunters and gatherers" during the Late Prehistoric period.

While my primary goal is to explain cultural adaptations of the Late Prehistoric period (A.D. 250-1700) in the Pine Breaks area of southeastern Montana, a general reevaluation of the Northwestern Plains cultural chronology is also conducted. This is in terms of 1) how the Pine Breaks culturally and geographically fit into the Northwestern Plains and 2) an evaluation of Late Prehistoric projectile point types and their temporal and functional affiliations. The reevaluation is based primarily on the results of the excavation of Benson's Butte, a butte-top campsite on the southern edge of the Pine Breaks area, and not primarily on bison kill sites, as much previous work has been. Although archaeological surveys in the area have yielded considerable amounts of data, systematic attempts to integrate and interpret this data have not been attempted on any but the smallest scale.

The following thesis can be divided into three parts. The first includes Chapters 1-3 which deal with introductory theoretical and cultural background information. This establishes a framework or structure in which to view the interrelationships of environment and human adaptations. The data base of the Late Prehistoric period in the area is summarized. The second part consists of Chapters 4 and 5. These chapters provide a review of the chronology of the Late Prehistoric period with respect to projectile

point typology and the introduction of the bow and arrow as the primary projectile delivery system. A manufacturing technique for Late Prehistoric side-notched projectile points is proposed. The last part (Chapters 6-8) focuses on the Pine Breaks as a geographically distinct area or physiographic province within the Northwestern Plains and the archaeological evidence for human adaptation within the area.



## Chapter 2.

### THE THEORETICAL FRAMEWORK

... an hour later when she awoke, she smiled mysteriously. "The life-span of the butterfly is precisely the right length," she said (Robbins 1971:6)

In order to interpret and explain archaeological data, a framework for the systematic organization of knowledge is necessary. The framework provides rules of procedures and a system of assumptions which allows interpretation and explanation of a wide range of circumstances. It is this theoretical framework which forms the basis for analysis, prediction and explanation.

Certain assumptions are made which are, in my opinion, basic to archaeological work. Most are theoretical and applicable to archaeology in general; others are more specific and particularly pertinent to this thesis.

## Assumptions

1. The spatial distribution of cultural materials over the landscape and at defined locations (i.e., sites) reflects past human behaviour. This behaviour can be explained by employing archaeological methods.
2. A systemic approach to the archaeological record is essential to interpret and explain prehistory.
3. Statements generalizing about past human behaviour are in terms of trends or tendencies, not laws.
4. Explanation of adaptive strategies and adaptive processes, rather than "culture", should be the goal of archaeology particularly in the Initial and Refinement stages of regional data base development.
5. Artifact typologies must consider processes of tool formation and attrition.
6. Late Prehistoric period (A.D. 250-1700) populations in the Northwestern Plains relied upon hunting and gathering for their subsistence base.
7. The direct ethno-historical approach cannot be used for the prehorse hunter-gatherers on the Northwestern Plains.

Assumption 1. The Spatial Distribution of Cultural Materials over the Landscape and at Defined Locations (i.e., sites) Reflects Past Human Behaviour. This Behaviour can be Explained by Employing Archaeological Methods.

Inter- and intra-site distribution of artifacts and features is structured by past human behaviour and natural site formation processes. The assumption that these remnants of materials and features made and left by humans indirectly reflects the behaviour of that human group or individual, and that this information can be collected by methods that will explain this behaviour is the basic premise of archaeology. Redman (1973:6) uses this concept as the definition of archaeology:

...the systematic (i.e., scientific) study of the nature and cultural behavior of human beings through the examination and analysis of the material remains of their past activities.

The assumption being that:

...the great complexity of these systems and processes is systematically organized and potentially understandable (Redman 1973:6).

Willey and Sabloff (1974) see this concept as the basis of the "contextual-functional approach" which they place historically as developing between 1940-1960:

...artifacts are to be understood as the material relics of social and cultural behavior....

and

...the way man arranged himself upon the landscape with relation to its natural features and with relation to other men, held important clues for the archaeologist in his understanding of socio-economic adaptations and socio-political organizations (Willey and Sabloff 1974:131-132).

This translates into the development of settlement pattern studies, the American approach to archaeology as anthropology, and the realization of the necessity to view archaeological manifestations in an ecological or environmental perspective.

Assumption 1 is made up of four schemes or levels of approach to archaeological remains: 1) as a unit with definable limits or a "site"; 2) as a site and its immediate environs or the site catchment area; 3) as numerous sites distributed over the landscape forming the local settlement pattern or "economic area" (Butzer 1971:401-402); and 4) the settlement pattern of a number of contemporary social units or groups in terms of the regional environment. Jochim (1979:88) recognizes the latter three as the levels of organizational complexity of archaeological data. In reviewing adaptive behavioural theories in regards to spatial, temporal and environmental considerations Kirch (1980:135) compares Jochim's divisions with a three level environmental division (local setting, economic area and regional environment) suggested by Butzer (1971: 401-403). In the above I have added the site, as a first level of study not addressed by Jochim and Kirch.

Archaeological method is designed to gather data, generally in acknowledgement of one of the four levels, and proceed with the explanation of the nature of human cultures which left the remains. The collection and interpretation of the patterned data is valid only if the exceptions in the patterns and the underlying causes are understood. Clearly cultural factors must be recognized as distinct from natural factors.

The physical relationship of one artifact or feature to another within an archaeological site is assumed to be important in the interpretation

and explanation of the archaeological record. Using a systemic approach the formation and disturbance processes which provide the exceptions have been detailed by several researchers. Schiffer (1972, 1976) details site formation processes. He notes (1972) that there are C-transforms or culturally defined items which are left at a specific location as the result of a specific activity, and N-transforms, or noncultural "post-depositional changes in site artifact morphology caused by non-cultural processes, such as wind, water, rodent activity and chemical action" (Schiffer 1976: 15). More detailed description of the specific cultural formation processes comes from specific activity analyses such as that associated with chipped stone (e.g., Schiffer 1976:99-128, House 1975). Detailed descriptions of environmental forces are described by others, e.g., Wood and Johnson (1978). There are also numerous problems in the interpretation of the cultural materials. Bonnicksen (1973) in his examination of Millie's camp revealed that activities suggested by the artifactual record were not always the correct interpretation when compared to the actual activity which took place at that location. Also Binford has indicated that ethnographic analogy cannot be depended upon:

...analogy should provoke new questions....and serve to prompt more searching rather than being viewed as a means for offering "interpretations" which then serve as the "data" for synthesis (Binford 1967:1).

The significance of these studies to Assumption 1 is that they detail varying processes of formation and disturbance, and the cultural and natural factors which can be expected to affect the interpretation of archaeological remains. The distribution of artifacts and features on the landscape can be used to explain human behaviour when the depositional mechanics are understood.

Assumption 2. A Systemic Approach to the Archaeological Record  
is Essential to Interpreting and Explaining Prehistory.

There are innumerable factors which affect the archaeological record, e.g., climate, ecological setting, and social and cultural practices. The importance of past environmental effects on past populations, and present and past environmental effects on the artifactual and depositional remains is emphasized by the environmental or ecological school of archaeology. Greater awareness of social and cultural factors which influence the archaeological record have been recently brought out by ethnoarchaeological and ethnographic studies aimed at such interpretive problems (e.g., Binford 1978b; Silberbauer 1972; Yellen 1977). How to deal with all of these factors without pointing the proverbial finger at one as "the cause" is difficult without employing a systemic approach. This is not to say that a simple, single cause cannot be isolated to account for a particular incident or action but that all variables must be considered.

It is most important to establish a framework in which the prehistoric populations can be viewed at a static point in time concurrently with a three dimensional model of a dynamic entity. The systemic approach provides such a framework. A system can be "...defined as a functioning set of elements that are interrelated so that a change in one affects the others" (Redman 1973:16). A human group can be viewed as a dynamic, fluid entity. It responds to changes in environment, inter- and intrapopulation pressures, changes within the society itself and changes from outside the immediate group. As a dynamic entity the behaviour of a population results from elements and patterns which are interrelated and articulated. The archaeological record is also made up of many factors, e.g., Schiffer's N and C transforms. In order to interpret and explain the cultural and adaptive

behaviour of prehistoric populations all possible factors which might have input into its operation must be considered. A systemic approach details this.

The systemic approach has been of significance to recent archaeological thinking because it stresses the importance of the wide range of factors affecting the archaeological record, and affecting the prehistoric population which is the target of study. It provides for the identification, separation, and detailing of the hydra of influences on archaeological remains and how these forces interact. Its importance is that it compels the archaeologist to divide and identify forces, actions or incidents, and to calculate their possible effects on changing cultural systems. The dynamics (e.g., interconnections, feedbacks, subsystems) of each cultural system produce a structure which can be broken down into its component parts. Each individual portion can be addressed in a manner which can provide a known set of relationships. Based on the development of the structural relationships (generally established as a flow chart) of the topic of study the operation of the system can be better understood. Even if an informal systems approach is used it provides a checklist and a set of possible interconnecting forces to be examined and considered. When such a structure is produced questions or problems can be examined without forgetting or ignoring the variables. The structure is then essentially a model of the specific behaviour of the prehistoric population.

.... there are two aspects of the modeling process. First, one establishes the "structure" or arrangement of the elements or entities of the system. Second, the system is then studied by actuating the static structure in order to observe the system behavior. In order to describe the structure, two things are necessary. One must isolate or define the most important entities. Each entity is characterized by certain properties .... These quantifiable properties are generally called variables... When one has chosen the variables, it is necessary to identify or postulate the interactions among them. (Cooke 1979:61-62)

In general, the systems approach has brought about a realization of the steps and the interactions involved in the formation and subsequent collection and explanation of the archaeological record. Clarke (1968) is generally credited as the champion of the systems approach in archaeology. Other archaeologists have used the concept in varying degrees, (Schiffer 1972, 1976; Flannery 1968). In general, the use of the systems approach in archaeology amounts to the structuring of the data by means of flow charts and utilizing a modified cybernetic vocabulary. Although attempts at quantifying influential variables have been attempted (e.g., Jochim 1976, Renfrew and Cooke, eds. 1979), the general use of and realization for the potential of an open systems model with full documentation and cognizance of variables has aided archaeologists. It has the potential to produce more formal designs for research and to interpret and explain the many variables in their collected data. Static and dynamic models of cultural change, whether they be related to simple societies or specific elements of a culture, benefit by the systemic approach. Mechanistic flow charts, often the most comprehensible part of such models, merely provide a visual grasp of the progression of ideas of the researcher. Formal quantifiable models are rarely used in archaeological studies and, in my opinion, are not totally necessary to make use of the general approach. However, informal models with all possible relevant factors integrated, will provide a framework for more complete interpretation of the specific archaeological problem.

In summary, a systems approach is a valuable tool for formulating an adequate theoretical framework in which to place collected data. The systems approach considers all pertinent variables by including consideration



of all relevant factors -- both internal and external -- while still allowing for close attention to small details. It also provides a means of quantifying and classifying data into measurable effects. In the absence of this approach large quantities of data become jumbled and meaningless, and are not useful in interpretive work. It provides a researcher an opportunity to indicate knowledge of all the steps and the many variables inherent in a particular problem in outline form. This in turn makes the explanation or interpretation of this information stronger and more persuasive.

Assumption 3. Statements Generalizing About Past Human Behavior Are  
In Terms of Trends or Tendencies, Not Laws.

In order to explain it (the past), it is necessary first to compare and then to go further and to generalize (Renfrew 1979:3).

Renfrew notes that the search for laws of cultural development as espoused by Watson, Redman and LeBlanc (1971), Schiffer(1976), Binford (1968) and others, based originally on the work of Carl Hempel, does not "offer the ideal framework for explanation". Renfrew, instead, suggests that the aim is explanation by generalization, not laws:

...the appropriate path to understanding is generalization, that is the formulation of general relationships between events and between processes, of which specific individual occurrences and phenomena can be seen as concrete expressions of manifestations.

The difficulty which Renfrew and others (e.g., Flannery 1973) have with the formulation of archaeological laws is possibly a matter of semantics. A law is viewed as a firm, generally unchanging statement, e.g. stop on a red light; for every action there is an equal and opposite reaction. Although in the above examples one is a social law and one a natural law, they are taken essentially as fact. The cultural relativist philosophy of anthropology which most archaeologists espouse makes it hard to believe that one law or statement can apply to all human societies. For example, a generally accepted statement is that water plays a major role in the location of a site for a family occupation. In support of this many sites are found along major rivers, near springs or on lakes, depending on the geography of the country. Accompanying this is the concept of minimizing the effort to gather the resource. Consequently, a commonly held idea is that since water is a necessary resource humans will place their occupation sites where it can

be obtained with a minimum of effort.

Some resources, such as water, are so basic and so vital that the distance to obtain them must be minimized; others are less immediate, are "worth" more, and may therefore be gathered from farther away (Roper 1979:121).

In southeastern Montana major base camps of the Late Prehistoric period are frequently not located adjacent to water sources. Rather they are often a 30 minute walk. There was, instead, an apparent choice for high locations where the observation potential could be maximized. Another exception is that campsites in colder climates located a considerable distance from a water source might reflect winter occupations where snow was the source of water for the group. Obviously, reasons can be found for these exceptions but the basic generalization that water plays a major role in site location will continue to be assumed for most regions.

Thus, rather than look upon such statements as laws, apparent regularities in the archaeological record should be noted and conceived of as tendencies, as suggested by Renfrew. Plog, although referring to Hempel-type laws, notes:

The multiple laws that affect the occurrence of events in the real world conditions outcome, but all are statements of tendency (1979:231).

Exceptions to a given tendency or generalization do not make it invalid. These generalizations are necessary to attempt to understand and reconstruct human lifeways. They can be approached as hypotheses to be examined and tested by future work.

Assumption 4. Explanation of Adaptive Strategies and Adaptive Processes, Rather Than "Culture", Should be the Goal of Archaeology particularly in the Initial and Refinement Stages of Regional Data Base Development.

Explanation of human adaptation is for archaeology a realistic goal. Past human activities should be detailed and interpreted clearly with reasons given for change. The implication is that for any specific prehistoric group religious thought, political philosophy, social and kinship descriptions can be explained. Although the ideal in archaeology is to explain culture and culture process, the data base for most regions is inadequate for such explanation. In these situations the emphasis should be on human adaptation rather than culture per se as a valid means of explaining the archaeological record. Spiess (1979) assumes adaptation is the sum of behaviour and purpose and applies this concept to the interpretation of reindeer and caribou hunters. In examining ethnohistoric human adaptation in the Cypress Hills, Saskatchewan, Bonnicksen and Baldwin (1978:14) stress cultural and environmental relationships. The basis of this theory is Bennett (1976). Bennett argues strongly that cultural anthropologists should be studying adaptations, or coping strategies rather than culture.

Culture is a linguistic convention used to describe the empirical consequences of minding; therefore, minding is what we should be concerned with. And a more descriptive label for it is adaptation.

Since there is continuity between the living and nonliving, to call culture a "superorganic" is to exaggerate the differences between humans and all other phenomena (Bennett 1976:848).

Bennett's primary argument is that the concept of culture be replaced by the concept of adaptation.

Adaptation is a word for the human capacity for coping with milieu in order to establish protocols of both freedom and constraint (Bennett 1976:852).

It is not necessary to agree with Bennett that the concept of culture should be scrapped in order to accept the idea of adaptation. The concept of adaptation, as proposed by Bennett and supported by Spiess (1979:4), says that "adaptation is making choices based on past experience (history) for anticipated needs".

However, behavior and purpose are not directly recoverable archaeologically. Thus, we need a method through which we can investigate the archaeological recoverability of these intangibles in hunter-gatherers. In addition, we need an integrative concept at the interface of the synchronic glimpse of particularistic history and the diachronic direction of culture change and accumulation of generalizations. The seasonal round, or yearly progression of subsistence activities, social group size and behavior, and technological utilization provide just such a focus.

The decisions to attempt subsistence or other activities, resource use, and scheduling by the band in question are the "adaptive" choices that taken together dictate the seasonal cycle of behavior. And, of course, there are environmental and technological constraints on those choices which are well within the province of environmental archaeological recovery. Archaeological sites are records of the resource use choices, or, rather, the human behavior necessary to carry them out. Short-term occupation sites are "synchronic" glimpses of the seasonal round, or slices out of the continuum of time. Other sites (and the diachronic synthesis possible from investigation of them) represent summations of many seasonal rounds or changes over time. Thus, at least in arctic and subarctic ecotone hunter-gatherers, all consideration of adaptation, human choice, and behavior, whether in the short run or for long-term or geographically widespread generalizations with a consideration of the seasonal round (Spiess 1979:5-6).

Another argument for focusing on adaptation and adaptive processes for archaeological explanation of hunter-gatherers is brought out by Sharrock (1974). Through an attempt to understand historic group structure and interaction she re-evaluated the concept of the "tribe". In reviewing ethnohistorical data on the Cree and Assiniboine it was found that:

...sociocultural units were graded into one another; and that the membership of one unit category was not necessarily correlative with the membership of any other (Sharrock 1974:95).

Rather than look upon the "tribe" as a discrete unit that can be:

...equated with the members of an ethnic unit, with the speakers of an interintelligible language, with territorial coresidents, and with a society comprising the carriers or practitioners of a particular cultures (Sharrock 1974:95).

a different approach is necessary. Rather:

The interpretation of interethnic social organization from a non-tribal perspective, one in which the ethnic unit, the linguistic unit, coresidence unit, cultural unit, and societal unit are not assumed to correspond in membership composition, has resulted in clarification, elaboration, and correction of the standard interpretation of interethnic social organization (Sharrock 1974:116).

In the study of adaptive strategies for hunter-gatherers the concept of the band is of special interest because most of the archaeological sites reflect such a small group of people. The band:

...concept is of special interest here especially as it relates to the formation of the Cree and Assiniboine subethnic units, which were simply differential, overt cultural forms assumed by the two primary ethnic units as they adapted to various ecological niches. Members of either ethnic unit adapted similarly to a specific ecological niche; thus, as the historical documents relate, the major differences between similarly adapted Crees and Assiniboines were often not overt cultural ones, but differences in social identity. Significant confusion exists in the historical literature with regard to identifications of an Indian or a group of Indians as Cree or Assiniboine, and descriptions of the overt cultural form manifested by one ethnic unit are often made in terms of that manifested by the other ethnic unit. The potential culture-bearing unit in a polyethnic society must correlate in great degree to the coresidence unit, or unit of social communication. The ethnic unit might act as a selective factor in the proscription or prescription of the assumption by an individual of particular traits from the pool of available traits manifested in the coresidence unit as a whole (Sharrock 1974:116).

If explanation of cultural or tribal groups is difficult in the ethnographic record, how can archaeologists expect to reconstruct them from scant physical remains? From ethnographic studies (e.g., Binford 1978b; Yellen 1977) we know that hunter-gatherer groups were subject to much merging and split-

ting. This changing structure springs from a multitude of factors, e.g. social conflict, season of the year, scheduled or planned hunts, fortuitous hunting encounters, and social visiting. The archaeological record will not be able to explain or, except rarely, even demonstrate this fusion and fission of groups. It is not going to reveal the ethnic identity of a group, at least in the Plains. Rather, it will reveal the adaptive strategies and processes which are conducted by these groups. This is particularly true when the regional archaeological record is poorly known.

The regional data base is a superstructure on and within which all interpretive or explanatory work is placed. It is also a limiting device that sets limits and parameters for all expository work. As detailed in the following text, the regional data base dictates to some degree what archaeological interpretation can legitimately be conducted. Unless the regional data base includes good temporal controls and a reasonable amount of well-documented data, it is much more realistic to focus on interpretation and explanation of adaptive strategies. When dealing with hunter-gatherers, I question whether the archaeological record can reveal culture and culture process.

Three stages of development of a regional data base can be defined. They are the Initial, Refinement and Explanatory stages of regional data accumulation. A recognition of these stages is important in that the amount and type of available data limit the interpretive capacities of a researcher. Table 1 describes the three stages and the general methodological approaches for each stage.

Table 1. Idealized Regional Data Base Development.

Stages	Goals	Objectives	Fieldwork Emphasis
I. Initial	Develop regional chronology	Identify temporal/cultural diagnostics	Excavate stratified key sites
II. Refinement	Describe the synchronic data (the static moment)	Explain intra-site activities	Inventory to locate key sites
	Define adaptive strategies	Gather and report all possible data	Excavate variety of site types
	Refine cultural/temporal chronology	Site catchment analysis	Intensive inventories
III. Explanatory	Explain cultural dynamics; culture change, culture processes	Settlement pattern studies	Problem oriented excavation and inventory
		Address specific goals	
		Test methods	
		Refine all objectives under Refinement stage	



## Initial Stage - I

The Initial Stage of data base development involves an emphasis on the excavation of stratified sites in order to produce a basic historical outline for a region. Generally, an assortment of items such as projectile points or pottery types, which change through time, are noted and described as horizon styles or markers. At this stage the recovery of a diagnostic tool type (or feature) allows for a general statement on the age of that prehistoric manifestation. The establishment of a regional chronology, or an outline of such, then provides a framework for the classification of sites and artifacts within this temporal framework. For the Northwestern Plains, William Mulloy provided such a temporal framework with the publication, An Historical Outline for the Northwestern Plains (1958) based on excavation and survey data from Wyoming and southern Montana. Frison (1978) has since elaborated upon this outline for Wyoming, and filled many of the gaps which, in general, Mulloy had anticipated. Although the focus was to establish this outline, much detailed work on specific sites was conducted and general methodological and technological concepts addressed.

## Refinement Stage - II

The second stage of information building is the Refinement Stage. This involves the excavation of more sites, including single component sites, and the collection of survey or inventory data. The emphasis at this stage is to develop a knowledge of static moments in the prehistoric record, i.e., what was going on at A.D. 200? A.D. 500? Collection of information of all types under strictly defined collection designs is the most efficient manner to accumulate larger quantities of data needed at this stage. Refinements in the chronology are made, and a solid data base begins to take shape. The focus should be on defining human adaptation at specific points in time. This involves study, not just of a site itself, but of its catchment area and associated settlement patterns.

Study of adaptation and coping strategies as evident in the archaeological record is the only reasonable focus at this stage. Adaptive choices such as subsistence activities, resource use, and scheduling of these activities can be described based on the archaeological record even with a relatively small data base. These data are collected intensively at the Refinement Stage and explanations and comparisons of these strategies can be conducted:

...a composite of these activities and their articulation...comprised the ongoing community...that is often referred to as "the culture" (Redman 1973:6).

Culture infers social organization, kinship ties, religious and political philosophies. This complex and somewhat intangible topic must wait until the data base has been developed to the Explanatory Stage before it can be seriously addressed.

To view the archaeological record in terms of culture process and culture change is premature at the Refinement Stage. Plog (1979:223) points out several problems with culture change studies and helps explain why such explanations should not be attempted at this level of regional knowledge. The primary fact is that this stage focuses on the development of static moments in the prehistoric record. To study change, a "before" and "after" must be known. At the Refinement Stage these points in time are, in general, unknown. Even if only several points in time are known through complete and well reported site excavations, the tendency to interpret or explain them in terms of change or process is tempting for the archaeologist. It appears that the two main problems Plog sees in culture change studies are caused by attempting such studies at the Refinement Stage rather than at the Explanatory Stage. The first problem is that even when a before and after point are known, there is no way of knowing how many points of change are in between, and thus there is no record of the actual change process itself.

A second problem, an almost inevitable consequence of the first, is the tendency to assume linear patterns of temporal variation. Given only two temporally discrete observations (before, after), one has no (sic) choice but to assume a linear trajectory. Yet, whereas two points are sufficient to define a straight line, there are a very large number of different curves, temporal trajectories, that may have connected two points. Moreover.... a linear trajectory is one of the more improbable (Plog 1979:223).

Thus, a regional data base in the Refinement Stage contains limited "befores" and "afters". If explanations of change which "seek to connect triggering events on the one hand and outcomes on the other" (Plog 1979: 223) are conducted at this stage, confusion and error can result. When the befores and afters are not well-defined, the stages in between are

not known, and consequently the causal factors for such changes can only be based on educated imagination.

The most important aim at the Refinement Stage must be to insure high quality work and reporting standards. Data collection should be conducted in a manner to gain a maximum amount of information and the reporting to be as detailed as possible. Interpretation will be based on the researcher's interests and objectives, but primary data must be made available to the entire research community. Only with this type of baseline data can archaeological interpretation at the Explanation Stage be readily and confidently conducted.

### Explanatory Stage - III

In the Explanatory Stage many of the before and afters, the static moments in time, are known. Static moments can be explained in terms of adaptive strategies in a particular environment or geographic zone. This means that population density, seasonal distribution, and relatively tight temporal controls are established. At this point true explanation of cultural processes can begin.

### Northwestern Plains: An Example of the Refinement Stage

The data base of Northwestern Plains archaeology is in the Refinement Stage. Relative to some other areas of North America, e.g., the Southwestern United States, the central Mississippi Valley, and the central Missouri valley, few sites have been excavated. As a result there is a paucity of information about the "before" and "after", an essential for culture change studies. In southeastern Montana, patterns of site distribution are now being recognized, and site catchment analysis is providing hunting, collec-

ting and resource procurement information. Excavation of large sites, such as Benson's Butte (L. Fredlund 1979), Kobold (Frison 1970a), Pictograph Cave (Mulloy 1958), is complemented by relatively small sites like Drifter's Shelter, a single component occupation site within a rock shelter with a living floor no larger than 6 square meters (L. Fredlund and D. Fredlund 1975). Studies of hearth formation and food preparation are on-going. Additional data on prehistoric adaptations throughout the Northwestern Plains is being gathered, and more baseline data generated.

One particular problem remains in the Northwestern Plains in general and the Pine Breaks area specifically: few sites are found with temporally/culturally diagnostic artifacts. Projectile points provide the primary diagnostic item but are often difficult to classify accurately because of variations due to manufacturing stage and secondary functions. Sites are too often classified to a specific temporal affiliation based on a single projectile point recovered from the surface. Although often the only diagnostic indicator, the interpretive problems are many. Through the Refinement Stage temporal/cultural indicators are being re-evaluated and better defined.

### Summary

The quantity and quality of collected and published regional archaeological data directly influences an archaeologist's ability to explain prehistoric activities. Necessary for valid interpretation of the archaeological record are: 1) good descriptive data at known points in time, and 2) adequate and "tight" temporal control. For example, in the southwestern United States absolute dating techniques have established an accurate

range of dates for diagnostic items and features, and through this and detailed excavation and reporting of many sites, temporal knowledge of the archaeological record is impressively tight. For many other areas of the world, where much less archaeological work has been done, temporal control and the historic chronology is only marginally known.

The development, or evolution, of archaeological method and theory has been described as a series of stages (e.g., Adams 1968; Willey and Sabloff 1974). The stages of development are described from a historical perspective to show how concepts and associated methods changed through time, and which scholars were responsible for these changes. Generally parallel developments can be described regionally for the development of a data base. Inherent in Assumption 4 is that the regional data base imposes interpretive limits on the archaeologist. The limits are not necessarily in the archaeologist's imagination. These three stages are indirectly a result of the general historical development of archaeological method and theory. Although discussed as successive stages, it is far too tempting to make a "quantum leap" from the Initial Stage to the Explanation Stage.

The emphasis on "scientific", processual or behavioural archaeology has caused many scholars to attempt to explain the archaeological record without considering the quality or quantity of the regional data base. As a result, much time and effort has been expended in the exercise of archaeological method and theory without an adequate data base. As a consequence there is often little return in useful information that can further the interpretation of regional prehistory. Quantitative studies have been conducted that only prove, basically, that the researcher is capable of using statistical methods (e.g., Beckus 1976, 1978). Other studies discuss culture change and processes without having the basic data to compare and contrast (e.g.,

Reeves 1970). For the level of interpretation which is the ideal in archaeology today -- the explanation of culture process -- hypothetical generalizations based on limited data are useful only if the author actually recognizes these limits. For instance, in the above examples Beckus (1976) attempted to describe the prehistoric settlement system in an area based on a survey sample which was not designed to be statistically interpreted. Reeves (1970:1-3), on the other hand, acknowledged the problems of his data but went ahead and provided a hypothetical model for prehistoric populations in the Northwestern Plains over the last 3000 years. Both Beckus and Reeves provided useful information but a firmer statement on the limits of their data would have been valuable.

Another problem is that sometimes there is great variation within a regional data base from one time period to another. Because of the number of sites excavated, the types of sites and the emphasis placed by specific archaeologists' interests at certain periods of time, the data base for all time periods will not be the same. Consequently, the stage of knowledge for certain temporally defined periods will often be more advanced than for others. For instance, on the Central Plains a considerable amount of information is known regarding the late farming villages along the Middle Missouri River. These sites contain house features and considerable quantities of artifactual material. Similarly, in midwestern North America much is known about Hopewell and later Mississippian groups. The mounds left by these populations caused considerable interest and have been the focus of regional archaeological work since the late 1800's. However, relatively little is known about the Archaic period in these areas. Thus, a region can be in all three stages of data base development simultaneously.

Assumption 5. Artifact Typologies Must Consider Processes of Tool Formation and Attrition.

The emphasis on and significance of projectile point types in Northwestern Plains archaeology makes this assumption critical. The recovery of a single projectile point is often used to classify a site temporally and culturally in inventory reports on the Northwestern Plains. It is undeniable that points change in recognizable patterns through time, and consequently provide a diagnostic item. Since projectile points are usually the diagnostic artifact, their proper classification is of critical importance. Unfortunately, correct classification or temporal assignment often does not occur for a variety of reasons.

Projectile points, as well as other tools, are subject to attrition through use. They also are found in various stages of manufacture. Both of these factors can, and do, cause misclassification resulting in a possible erroneous regional chronology. Jelinek (1977:18) calls the concept of formation and attrition of tools the "Frison Effect". This is based on Frison's work at the Piney Creek sites (1968a) in which he points out the inherent difficulties of typing or classifying stone tools because of the many formal transitions through which each piece of stone must pass. This creates somewhat of a dilemma for archaeologists working in areas, such as the Northwestern Plains, where lithic materials are the primary cultural, chronological and functional indicators.

Recent work on lithic technology through replication (Callahan 1979), ethnographic observations (White and Thomas 1972; Yellen 1977), and functional studies (Hayden 1979; Brink 1978) has provided knowledge which allows for much greater understanding of the working characteristics of



different crypto-crystalline materials. A study conducted at a chert quarry in Maine (Gramly 1980) has shown that, through technological and functional understanding plus a knowledge of quarry source locations and their particular attributes, insights into the adaptive strategies of the region can be obtained. Analysis of lithic debitage based on technological replication (e.g., Ahler 1970, 1975; Bradley 1975; Crabtree 1972), has provided more detailed information on the maintenance or manufacturing of types of materials at specific sites. Taken in the context of a site catchment area, for instance, this information will help to better define activities and use of materials.

Even though projectile point types are recognized, all must be re-evaluated in terms of not only the Frison Effect, but also lithic manufacturing techniques and functional studies. For example, Green (1975) has re-evaluated the relation of the McKean (a Middle Plains Archaic point type) and the Little Lake point type (a Great Basin Archaic point). Morphologically they are extremely similar and had been previously classified as one type. Closer examination revealed that the manufacturing techniques for the two types were very different and in fact, represented two distinct traditions. Prior to Green's study, this error in typological classification led to some rather severe misinterpretations of the record.

Classification systems have always been characterized by the "lumpers" and the "splitters". In working with stone tools much of the discrepancy has been caused by a lack of knowledge or a reticence to recognize the stages of attrition and formation. Much of the confusion and misunderstanding of cultural associations and temporal phases in the Northwestern Plains is directly tied to this. The concept inherent in this Assumption is the basis for the reevaluation of the projectile point chronology on the Northwestern Plains in the Late Prehistoric period, and can easily be extended into other periods as well.

Assumption 6. Late Prehistoric Period (A.D. 250-1700) Populations  
in the Northwestern Plains Relied upon Hunting and  
Gathering for their Subsistence Base.

Although Middle Missouri agriculturists undoubtedly contacted and influenced, either directly or indirectly, the Late Prehistoric period populations on the Northwestern Plains, the primary settlement/subsistence pattern was based on hunting various animals and gathering plant foods. Bison was the animal most often sought. In focusing on, and attempting to explain the particular adaptation of Late Prehistoric populations, the ecological background becomes an extremely important consideration.

Of all the peoples studied by anthropologists, hunter-gatherers are the most likely to be considered in ecological terms. Their relationship to their physical environment is so direct, since they depend on naturally occurring plants and animals for daily food, that it seemed obvious to view subsistence techniques as largely conditioning their way of life. Moreover, the tools and method of exploitation of such peoples are usually simple, providing little opportunity for food accumulation and storage and scant protection from the elements (Netting 1977:8)

The limited accumulation of artifacts and features, not sites per se, in the Northwestern Plains tends to emphasize this. In the Pine Breaks area particularly, the large numbers of sites, generally represented by chipped stone debitage and a few tools are relatively dispersed. It supports the dispersed band concept as discussed by Wilmsen (1973). He notes that flexible resource strategies, combined with flexible band organization, has the potential to provide a stable food supply. Because the animal food resources are varied in their habits --some being always available, and others seasonally available barring unforeseen climatic episodes -- the overall human population of the Pine Breaks would probably have had a relatively stable supply of food. Most important is the:

fact that, far from being pressed to the wall by want and unavailing exertion, hunter-gatherers (1) have a food base that is with minor exceptions adequate and reliable; (2) expend minimal labor to provide for their physical needs; and (3) live often to a ripe old age with few signs of anxiety or insecurity (Netting 1977:10).

The social unit necessary to a hunting-gathering group is a fluid, nuclear family-oriented band. The food resource availability, social pressures, and a general migratory nature essential to this life style encourage such a flexible unit. Many recent ethnohistoric and ethnographic studies have supported this, e.g., Yellen (1977); Binford (1978); Lee and DeVore (1968). Through successful adaptive strategies hunter-gatherers can potentially live a relatively relaxed, crisis-free existence characterized by social fluidity caused by fluctuations in group size at various times of the year, and relatively stable food, water and fuel sources.

Assumption 7. The Direct Historical Approach Cannot be Used for the  
Prehorse Hunter-Gatherers on the Northwestern Plains.

It should be significant to the archaeologist who attempts to reconstruct the story of Indian occupation of the Northwestern Plains that such evidence as we have from nonarchaeological sources strongly suggests that none of those tribes which I have termed resident tribes [Sisika, Blood, Piegan, Gros Ventres, Cree, Assiniboin, and Crow] of this area in 1800 inhabited that portion of the area in which they lived during the nineteenth century for any considerable period before 1800 (Ewers 1968:72).

In drawing on the ethnographic record of the area there is essentially nothing to provide an ethnographic framework for the cultural groups in the prehorse era. Historic tribes, as pointed out by Ewers, were all relatively recent migrants and had or were in the process of adapting their traditional cultures to a Plains environment and to the use of the horse. When ethnographic analogy is used, non-Plains hunter-gatherers are better subjects for such analogy than are the historic tribes of the area. There are many examples in the archaeological literature of the Northwestern Plains where assumptions have been made based on ethnographic data which are slowly being disproved. In the interim they have caused much erroneous interpretation of the prehistoric record. Several such analogies from ethnographic works, used directly in archaeological interpretation, are discussed below.

It is common for archaeological reports to contain lists of edible plants in the area of concern based on ethnographic and ethnohistoric studies, (e.g., Gregg 1977; Reher et al 1977; Mulloy 1958). Unless the remains of these foods are actually found in archaeological context the list is essentially irrelevant. It is nice to know there are large numbers of edible plants for the gathering but the information can only be useful if there is accompanying archaeological evidence. The Crow, for

instance, gathered in the past and still gather Indian turnips (*Psoralea*). Although widely available throughout the Plains, certain groups did not emphasize this plant, whereas to others it was a major food resource (Kaye and Moodie 1978). Based on work in the southwestern United States and northern Mexico, Wetterstrom (1978) points out that food tastes change through time, and even though a particular food is readily available it may not be used. Similarly, technological advances or changes such as the use of the horse in bison procurement can cause food preferences to change. As a corollary, people living in the same area at the same time emphasize different foods. This allows greater population density in an area since there is a lack of competition for a specific food source (Bonnichsen and Baldwin 1978). One can see, then, that availability of a resource in an area does not necessarily imply its use by prehistoric peoples.

As previously discussed in some detail, Sharrock (1974) has examined reasons for focusing on ethnic, linguistic, coresidence, social, or cultural units in order to understand historic group interaction and structure, instead of using the concept of "tribe". Studies which use archaeological data to relate to specific historic tribes need to consider Sharrock's concepts. In Montana and Wyoming sites have been found where the ceramics have been suggested to be of Crow Indian origin (Frison 1979), but there has been considerable controversy (Johnson 1979, Taylor 1979) over this ceramic/tribal classification. Much of this difficulty is probably related to prehistoric human group fluidity and varying allegiances as described by Sharrock. Taylor (1979:46) suggests:

The band...fits more precisely what we do in fact perceive as archaeologists. The conventional viewpoint of continuous and gradual development of Plains culture from the prehistoric to the historic has so far led only to a cul-de-sac.

Another assumption that causes interpretive difficulties on the Northwestern Plains is centered around bison hunting. An example is that many groups, in anticipation of the coming winter, made a great communal effort, the fall buffalo hunt. With more and more data accumulating for the regional data base from bison growth studies (e.g., Reher 1970; Frison 1978:277-300) and with input from historic accounts (e.g., Arthur 1975) it is now known that fall was not necessarily the only time for prehistoric groups to conduct bison drives. Rather, it is evident that bison were hunted in all seasons of the year.

Archaeological interpretations of bison utilization on the Northwestern Plains have depended largely on ethnographic analogies and inferences based on the excavation of late prehistoric and historic bison drive sites.... future archaeological studies in the Northwestern Plains would surely benefit from interpretive schemes that minimize analogy.

The prehistoric model of Plateau bison utilization developed independently of the ethnographic data provides an understanding of the subsistence adaptation to Plateau bison hunting. Working from the prehistoric model provides an alternative explanation for the origin of the ethnographic pattern. It should be possible to generate similar models in Plateau archaeology that not only elucidate prehistoric cultural adaptations but also make the ethnographic descriptions more meaningful in terms of a general culture-historical evolution of Plateau cultures. Similar approaches might be useful for understanding the nature and development of subsistence adaptations to bison in other areas, particularly the Northwestern Plains (Schroedl 1973:65).

Schroedl (*ibid*) suggests that prehistoric models based on archaeological data are probably far more useful in explaining human adaptations than are ethnographic models that are not really applicable. Although the direct historical approach, when used properly, can provide a significant framework for archaeological analysis, it cannot be done with validity for most archaeological work on the Northwestern Plains.

## Chapter 3.

### THE LATE PREHISTORIC PERIOD ON THE NORTHWESTERN PLAINS: A PERSPECTIVE

#### Introduction

The Late Prehistoric period on the Northwestern Plains begins essentially with consistent use of the bow and arrow. This is reflected by smaller projectile points, arrows and bow parts recovered from dry caves, e.g. Wortham Shelter (Greer 1978), Pictograph Cave (Mulloy 1958), Spring Creek Cave (Frison 1965), and Mummy Cave (McCracken 1978). The classic projectile point marking the introduction of the Late Prehistoric period is the Avonlea, a small side, almost corner, notched arrow point. This was first defined by Kehoe and McCorquodale (1961) and has been used ever since as an horizon marker for the initiation of the Late Prehistoric period on the Canadian Plains. In southern Montana and Wyoming, Avonlea or Avonlea-like points are common, and they are contemporary with sites containing many variations of small corner to side notching (Frison 1978:64).

Often considered to be contemporary with the small side-notched arrow point tradition, the Besant phase contains larger side-notched points and pottery (e.g., Reeves 1970; Morgan 1979). However, Reubelmann (1981), based on compilation of Besant associated radiocarbon dates, argues that Besant is a Late Archaic manifestation and is not contemporary with Avonlea. In Wyoming the Besant complex is placed by Frison (1978) within the Late Archaic with the radiocarbon dates A.D. 150 at the Ruby site and A.D. 230 at



Muddy Creek.

The region known as the "Northwestern Plains" varies with each author's perspective and, as such, how the area is defined by the different authors is important to understanding that particular person's view of the prehistory. Frison (1978) defines the Northwestern Plains as what is essentially Wyoming. Morgan (1979) is generally referring to the Canadian Prairie provinces. Reeves (1970:4) assumes a broader approach which includes an area as far south as northern Colorado, to the aspen parklands in the north, the Rocky Mountains on the west and to the "woodlands of Manitoba, Minnesota and Iowa". For the purposes of this work, the Northwestern Plains is considered as a large physiographic province essentially similar to Reeves' but focusing more on the short grass prairies of the western plains rather than the mixed prairies of the east (Figure 1). As Conner (1968:13) cautioned the description of the area considered as the Northwestern Plains is:

...taken without regard to fluctuating cultural borders.  
In effect, it is a basis for discussion and not a definition.

The following discussion focuses on the Pine Breaks of southeastern Montana as a part of the Northwestern Plains and the explanation of the adaptive situations for human groups in that particular geographic area.

The date for initiation of the Late Prehistoric period varies from north to south. For Wyoming, Frison (1978:62) places the beginning date at A.D. 500. Morgan (1979:208) in reviewing data from the Canadian Plains, notes that:

There is ... general agreement that the initiation date  
for Avonlea on the northwestern Plains is about A.D. 150 to 250.

For southeastern Montana I have placed the initiation date at A.D. 250 based particularly on radiocarbon dates from the Sly Bison site, the earliest being  $1620 \pm 200$  years: A.D. 330 (TX-3782) and  $1600 \pm 100$ : A.D. 350 (TX-3786).

This will be subject to revision as more and better dates are obtained.

The initiation of the Late Prehistoric period corresponds with the general appearance of small, notched arrow points in other areas of North America. In the southern Plains of north Texas small side-notched arrow points were introduced around A.D. 900-1200 (Lynott 1981:105). The eastern Plateau of Washington is represented at this time period by the early and late Harder phase. The primary distinguishing feature between the early and the late is a change in settlement types from camps to villages around A.D. 1300. Accompanying this settlement change, and pertaining to this discussion, was a change in projectile point types:

Artifact assemblages of the earlier subphase are characterized by large, basal-notched projectile points and corner-notched points called "Snake River corner-notched". In the later subphase, the large basal-notched forms are relatively rare, and small, finely made corner-notched forms are associated with the Snake River corner-notched type (Leonhardy and Rice 1970:14).

Similarly in the Great Basin and southern Plateau the bow and arrow with small projectile tips (Rose Spring Side and corner-notched) are represented in stratified cave deposits. At A.D. 1300 the Desert side-notched type became popular. Although the use of small arrow points began around A.D. 600:

the bow and arrow was in use by the occupants of Hogup Cave by ca. 1250 B.C. and that it had replaced the atlatl and dart as the primary weapons system by ca. A.D. 400, and probably by several centuries earlier (Aiken 1970:184).

At Dry Creek Cave small notched arrow points (Rose Spring and Eastgate series) appear:

at least by level 10, dating to ca. 2400 B.P. and perhaps earlier... That the bow and arrow did not immediately replace earlier dart points at Dry Creek can be seen in the persistence of Elko Series points through level 5 (1550 B.P. to 1450 B.P.). Arrow points became dominant by level 7 (ca. 1710 B.P.) but were not the exclusive form until level 3 or about 1410 B.P. (Webster 1978:29).

The use, albeit limited, of the bow in the Great Basin and southern Plateau almost 1000 years prior to its general acceptance throughout the west is still somewhat conjectural. However, the acceptance of the bow and arrow as the primary projectile delivery system and the subsequent adaptive strategies developed for its use were reflected throughout the Northwestern Plains by A.D. 500 and much of eastern North America A.D. A.D. 1000. In most areas, as noted above for the Plateau, changes in settlement patterns and other associated phenomena occurred.

For southeastern Montana similar changes took place. Waldman (1979) and Munson (personal communication, 1981) record that Late Archaic settlement patterns tend to focus more closely to water courses than Late Prehistoric sites in the Pine Breaks area. Details of this adaptation have not been compiled at this time but a definite pattern is emerging. The definition of the temporal affiliation of the sites is, again, projectile points. So, cultural chronologies spring almost directly from projectile point typology as the only indicator of cultural and temporal changes.

When studying Northwest Plains prehistory it becomes apparent that there are essentially two schools of thought, which I call the "Calgary school" and "Wyoming school". Although some might object to this classification, much of the published material is the result of influence of archaeologists affiliated with either the University of Calgary or University of Wyoming. The Pine Breaks of southeastern Montana are midway between the two geographically, and archaeologists from both schools have touched on the archaeology of southern Montana slightly. Although other researchers have contributed, e.g., Loendorf (1969), Conner and Conner (1971), Husted (1969), and Brown (1969), the main influence has come from Calgary, Alberta, and Laramie, Wyoming.

Historically, the Wyoming school was influenced by William Mulloy who in 1958 established the most accepted chronology of the Northwestern Plains. Other chronologies were developed, e.g., Wedel (1961), Malouf (1956), and Taylor (1964), but Mulloy's was the most complete and became the basis for further work. (See Reeves 1970, Figure 1 for a complete listing of the relationships of these and other chronologies.) Much of the archaeological data on which the chronology is based is from Pictograph and Ghost Cave, just south of Billings, Montana, and from other sites within the Pine Breaks and in Wyoming. A three stage chronology of Early, Middle and Late Prehistoric periods was described in terms of artifacts diagnostic to each period. Late and Historic period items were felt to be so closely associated that no distinctions were made. George Frison and associates expanded considerably on Mulloy's data and filled in many gaps. Briefly, Frison (1978) sees the Late Prehistoric period in Wyoming beginning around A.D. 500 with the introduction of small side- and corner-notched arrow points:

Both the small corner-notched and the side-notched bow and arrow projectile points occur at about the same time; together they reflect a number of different cultural groups (Frison 1978:64).

Avonlea projectile points make up one of the forms of these small side-notched points. They are characteristically of "excellent workmanship" with:

well executed, shallow, broad, and usually parallel flake scars that extend from the blade edges to the mid-point of the blade or beyond. The small side-notches are "V"- or "U"-shaped, but never rectangular. The notches are very low on the blade, equidistant from the base, and symmetrical. The base is moderately concave; it may be straight but is never convex (Johnson 1970:45).

Avonlea-like or "degenerate Avonlea" are the same as the above but are not as well-made. Of particular interest to this thesis is Frison's recognition of:

A little-known cultural manifestation of the Late Prehistoric period, widespread over the mountain and foothill areas of northern Wyoming and southern Montana, is characterized by small, thin, delicately made projectile points with a wide range of notching styles. One radiocarbon date of around A.D. 1400 B.P. (RL-538) has been obtained. Campsites are especially common to butte tops and rims along deep canyons and contain large amounts of faunal material compared to sites of the preceding Late Plains Archaic period. Faunal materials include bison, deer, mountain sheep, and many smaller animals. Cultural assemblages are rich in small stone and bone tools (Frison 1978:71).

Benson's Butte typifies the above description and indicates the recognition of a distinctive regional variant.

Projectile point styles then tend toward side-notching farther up the blade from the base, with more square bases. Finally, basal-notched forms appear in the late part of the period. Basal-notching is common at the Protohistoric Big Goose Creek site (Frison 1967a) and in the more recent levels at the Vore site (Reher and Frison 1980).

Pottery is another diagnostic item at sites of the Late Prehistoric period. Frison (1978:64-67) recognizes several distinct types relevant to southern Montana: a rather poor quality flat-bottomed Intermountain ware, Woodland pottery, Crow-Mandan type, and a pointed bottom type suggestive of Woodland, but possibly Athapaskan in origin (Frison 1973, 1978).

Bison procurement during the Late Prehistoric was most commonly by means of corrals. Later "the classic buffalo jump dominated the scene" (Frison 1978:247). Trapping of antelope, sheep, and other animals is known from ethnographic reports and from several Late Prehistoric and Protohistoric sites in Wyoming and Montana, e.g., Frison (1978: 251-276; Keyser 1974).

The approach to projectile point typology of the Wyoming school has

been to maintain an awareness of varying types, but with a tendency to avoid nominal classification. Frison et al (1974) formulated the concept of "technofacies", combining the concept of artifact assemblage and site component.

Stratigraphic units, both in a geological and archaeological sense, usually demonstrate more than one aspect and each can be regarded as a facies. The archeological assemblage is of human conception and manufacture, which suggests a technological process. Variation within a technofacies reflects such things as individual abilities and preferences, whereas intertechnofacies differences reflect such things as functional differences in tool assemblages resulting from different kinds of cultural activities.

The number and kinds of things that have resulted in differences between cultural assemblages within a single stratigraphic unit are therefore many, but there is still enough internal consistency for typology to be useful as a temporal indicator and a functional use determiner (Frison 1978:17).

After discussing the importance of experimental studies on lithic assemblages Frison remarks further on typology:

From such experimental-functional studies, better descriptions of past lifeways are appearing. In this sense typology is not a narrow study destined to be an end in itself. On the contrary, it is an ever-expanding means of inquiry into other aspects of culture (ibid).

Frison and the Wyoming school have been inclined to build upon the data base with caution about implications concerning overall regional and cultural ties. Reeves (1970), as an example of the Calgary school, speculated on population movements and intergroup associations based on few well-documented sites and relying heavily on projectile point typology and seriation. Where Frison uses the concept of technofacies for discerning different prehistoric groups, Reeves uses the concept of phase, subphase and tradition defined by "artifact systems", primarily projectile point types as defined by Kehoe (1966, 1974) and Forbis (1962). Reeves (1970) provides a description of the methodology for much of this

interpretation, and the resulting chronology. It is based on Willey and Phillips' definition of a phase:

An archaeological unit possessing traits sufficiently characteristic to distinguish it from all other units similarly conceived, whether of the same or other cultures or civilizations, spatially limited to the order of magnitude of a locality or region and chronologically limited to a relatively brief interval of time (1958:22).

Reeves notes that his use of phases and subphases differs from the above:

...primarily in order of magnitude..... This is justified by the nature of the material and the lack of terms for archaeological units... The nature of the environment of the Northern Plains, the lack of geographical barriers to the movement of people and the diffusion of ideas and actual items, the similarity of exploitation of the environment may well mean that the units at the phase level will be larger in the Plains than in other culture areas.... In my scheme, a phase does not necessarily correlate with a locality, region, or even an area. The area occupied by a phase may change through time and it may in fact be found in two environmentally distinct areas (1970:22).

The techniques used in this thesis for integrating component into phases, phases into cultural traditions, and organizing data for use in inter- and intraphase comparisons include simple ones of differential frequency distributions and the presence-absence of certain traits.

Some cultural items and systems are emphasized at the expense of others. These are the ones which have proved pragmatically most useful in characterizing the phases and studying their intergroup relationships. Since more data are extant on the artifact system, it receives more emphasis (Reeves 1970:24).

Much of Reeves work appears to be based on a typological system formulated by MacNeish (1954), Forbis (1962) and Kehoe (1966). MacNeish recognized the many varieties and types of projectile points, while Forbis greatly expanded the sub-division of types based on excavation of the Old Women's Buffalo Jump. Expanding on this, Kehoe (1966) discussed the small side-notched point system and divided the small side-notched arrow point types into three major types, each with associated varieties. Each of the three types are thought to represent different ethnic traditions: Avonlea were Athapaskan speakers, Prairie point users spoke Algon-

kian and Plains types were brought in by Mississippian or Middle Missouri villagers (Kehoe 1973:77-78). The assumption is that:

The significant features of these points are chronologically sensitive. They seem to reflect a dynamic interplay between the influence of function and that of cultural contacts (Kehoe 1966:828).

And based on this assumption, using Rowe's (1959) system, Kehoe continues that:

Following the fundamental sorting by features, it has been possible to cluster the late Plains points into describable varieties and to group these varieties into types to form the Plains small side-notched point system (Ibid).

Although Kehoe notes that the "boundaries between types and between varieties are breakthroughs" for archaeological knowledge on the Plains, he acknowledges:

Types and varieties are arbitrary, however, insofar as sharp differences are lacking between the clusters of a system. Late Plains projectile point varieties do grade one into the next, as is consonant with the observed continuity of features over centuries (1966:829).

Based on Kehoe's or a similar scheme, Reeves uses the many variations in point types to form his Northern Plains cultural schemes.

Components are assumed to represent residential groups.... The phase represents a social-cultural group.... Although the population may shift within the groups, the common social, cultural, and genetic bonds result in formal types having a higher frequency occurrence within than between groups (Reeves 1970:25).

Using the above concepts, Reeves provides a hypothetical model of prehistoric cultural groups and their interrelations based on little concrete data. Although the rapidly accumulating information on the Northwestern Plains now is suggesting changes (e.g., Byrne 1973; Davis and Fisher n.d.; Fredlund 1980), Reeves (1970) provided a spatial framework of Northwestern Plains prehistory to complement the chronological one estab-



lished by Mulloy (1958) and Frison (1978). Byrne (1973) has posited a slightly different model based on ceramic types. His breakdown for the Late Prehistoric period subdivisions are followed here: Period I, A.D. 150-250 to A.D. 1150; Period II A.D. 1150 to 1700; and Period III, corresponding to the Protohistoric. The latter will not be discussed in any detail.

#### Late Prehistoric: Period I (A.D. 150-250 to A.D. 1150)

Period I essentially correlates with the introduction of Avonlea and Avonlea-like materials throughout the Northwestern Plains. However, in southern Montana and Wyoming, for instance, other point types and other associations are recorded. Period I includes Reeves' Avonlea phase but also contains other not so specific variants. He places Avonlea from A.D. 150-250 in Alberta-Saskatchewan and A.D. 500 - 600 in southern Montana. For most areas the termination date is around A.D. 900 (Reeves 1970:102). Byrne (1973) and Davis and Fisher (n.d.), using more recent data, place terminal Avonlea at A.D. 1150. Several point varieties are generally part of this phase: Head-Smashed-In Corner-Notched and Timber Ridge side-notched. Ceramics are commonly associated. Many of the known Avonlea sites are bison kills. Reeves (1970: 176-181), after reviewing origins of small points associated with the bow and arrow, states that Avonlea is most closely associated with the earlier Pelican Lake phase and that Avonlea is an indigenous outgrowth of Pelican Lake. Avonlea association with the later Old Women's phase is not clear from Reeves (1970). He implies that its influences stem from Besant and merge with Avonlea to form the Old Women's Phase.

Several hypotheses have been suggested for population movements and influences during the Late Prehistoric period. Avonlea is suggested to have been the first of the small arrow points to come onto the plains and into the intermountain area, and it is felt that this movement must have taken place from the north (Kehoe and McCorquodale 1961). Husted (1969:93) in interpreting the archaeology of the Bighorn Canyon:

...suggested that the Avonlea-like projectile points replaced the small, corner notched arrowpoint in Shoshonean culture... Avonlea sites appear to be oldest in the north, suggesting a southward movement or expansion of the Avonlea complex between about A.D. 400 to 700.

It is suggested that Avonlea complex peoples moved south down the northwestern Plains from Canada, came into contact with the Shoshone somewhere in Montana, and eventually moved eastward to the Missouri River in South Dakota reaching this region by about A.D. 800 to 1000.

For southern Alberta and Saskatchewan, Byrne (1973) makes a strong case for a relatively indigenous development called the Saskatchewan Basin Complex. This begins with pottery associated with Avonlea style projectile points around A.D. 200, and continues relatively unchanged through the Old Women's phase into Protohistoric times (A.D. 1700), when trade or mixing with populations south of the Missouri Coteau was accelerated. There is also evidence that the Besant groups were coexisting with the Saskatchewan Basin Complex people but remained fairly distinct until late in the period (A.D. 800), when they began to merge with other groups. Thus, in southern Alberta throughout the Late Prehistoric, infusion or diffusion of cultural traits coming from the east was reflected in the ceramics. This change was a slow diffusion process and not a massive migration of populations, as suggested by Husted (1969) and Kehoe and McCorquodale (1961).

Syms (1977) suggests Avonlea sprang from the groups associated with the Middle Woodland Laurel pottery tradition who then moved onto the plains. Morgan (1979), basing her interpretation on the Garrett site in southern Saskatchewan, feels that the influence of Avonlea came from the upper Mississippi Valley as an indirect result of climatic change. Cooler climates forced the Woodland-Hopewell groups to emphasize hunting rather than agriculture. This brought about a move onto the Plains to hunt bison. The increase in cool conditions coupled with increased moisture on the Plains encouraged bison to disperse and probably increase in numbers. In response, human hunters moved farther onto the Plains during a time favorable to adapting to a plains/bison hunting settlement/subsistence system.

Benson's Butte (L. Fredlund 1979) and Arrowhead Rock (Visborg 1972) contained Avonlea and Avonlea-like projectile points. Arrowhead Rock is a butte-top site reported by Visborg, a collector, on whose land the site is located. It contained a variety of tools and tool types which were found on the surface and in limited uncontrolled excavations. Benson's Butte is a multi-component, generally unstratified site in the southern edge of the Pine Breaks geographic area. The excavation and subsequent analysis provides much of the basic data for this thesis. The site is an occupation site reflecting, based on 11 radiocarbon dates, an early Late Prehistoric Period I (A.D. 400-1000) occupation. Numerous projectile points and preforms in various stages of manufacture provides a sample of artifacts which reflect specific methods of projectile point manufacture. A rock-walled dwelling structure (Figure 2), a variety of features associated with food preparation, and a large number of tool types were recovered. At least one tool type, a flake with one or more



Figure 2. Rock-walled dwelling structure at Benson's Butte.  
(From L. Fredlund 1979: Figure 66)

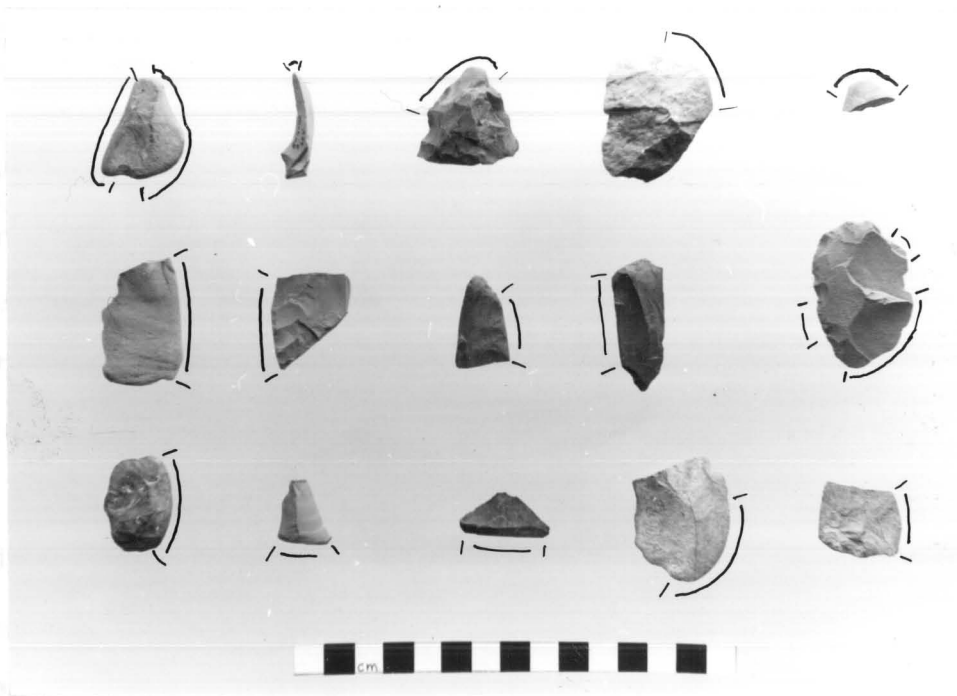


Figure 3. Smoothed, rounded edge flake tools from Benson's Butte. They are thought to be diagnostic of the Benson's Butte-Beehive complex. Lines indicate smoothed edges. (From L. Fredlund 1979: Figure 33)

edges or corners which were purposely rounded and smoothed, is thought to be diagnostic of this temporal/cultural affiliation (Figure 3). The site information is of primary importance to the interpretation of the Late Prehistoric period in the Pine Breaks area and to the reevaluation of projectile point typology of the region. Drifter's Shelter (24BH1727) (L. Fredlund and D. Fredlund 1974; Herbort 1981a) is also thought to be associated with this period. It yielded a single radiocarbon date of  $1000 \pm 80$  years: A.D. 950 (TX-2367) and a rounded, smoothed flake tool which appears to be diagnostic of the Benson's Butte material. These sites appear to be part of the "Little known cultural manifestation" described in Frison (1978) and quoted above. Similar artifacts and features have been recovered from the Beehive site (G. Zeimens, personal communication 1980). A radiocarbon date from this site is  $1400 \pm 100$  years: A.D. 550 (RL-538) (Frison 1978:61).

In southeastern Montana, Avonlea points are relatively scarce. L. Davis (1975:37) notes that Avonlea and Besant which are "characteristic early Late Period phases" were not found in the Indian Creek survey in the Wolf Mountains. From inventories in the Pine Breaks covering approximately 50,000 hectares, only eight of 500 sites have been found to contain Avonlea or Avonlea-like points (Table 2). This relative lack of Avonlea or Avonlea-like projectile points is somewhat aberrant in that Avonlea points commonly occur throughout the Northern Plains. At present, the reason for this is speculative. Table 2 provides information on temporally classifiable components of sites in the Pine Breaks. The classification of site components are as in the original reports when possible but have been adjusted to reflect new information. For instance, Gregg (1977a) classified stone circle sites as being within the Late Prehistoric

Table 2. Temporal Affiliation of Site Components from Thirteen Inventories in the Pine Breaks Area.

Name of Project (Author)	Approximate Acreage (Hectares)	Number of Sites Recorded (Isolated Finds)*	Affiliation of Temporally Identified Components								
			Paleo- Indian	Archaic			Late Prehistoric				
				Early	Middle	Late	IAvon	IOther	II	I & II	III
Bighorn-Jensik Hill (Hogan & Anderson 1979)	5220 (2112)	10 (169)	- (1)	-	- (2)	- (2)	-	-	1 (2)	-	-
Kiewit-Whitney (Gregg 1978)	1320 (534)	17 (42)	-	-	-	7	-	-	-	-	-
Holmes-Decker (Gregg 1977a)	5760 (2331)	20 (29)	-	-	2	4	-	-	3	4	-
East-North Decker (Fred- lund 1977)	8000 (3238)	21 (90)	- (1)	-	1	1 (1)	1	1	1	- (2)	- (1)
CX Decker (Gregg 1977c)	6200 (2509)	42 (92)	- (1)	-	1	8 (3)	1	-	3	5 (3)	-
Spring Cr. (Fox 1977)	4000 (1620)	35			3	9	-	1	3	1	-
BLM (C. Davis 1976)	48,640 (19,684)	127	1	-	2	11	2	-	2	3	-
Decker-Pearson Cr. (Gregg 1979)	2360 (955)	16 (61)	-	-	1	2 (4)	-	1	1	1	-
Indian Cr. (L. Davis 1975)	23,606 (9553)	129	2	2	10	23	-	-	-	7	-
Youngs Cr. (Fredlund 1981)	6000 (2428)	26 (94)	1 (1)	-	2 (1)	5 (6)	3	-	4	5 (2)	3
WECo Area C (Cultural Resource Div. 1980)	6080 (2460)	36 (368)	-	-	-	3 (9)	-	- (2)	6 (1)	4	1
Peabody Area A (Munson & Munson 1980)	2500 (1012)	21 (66)	-	-	1	3	1	2	5	-	-
Totals	119,686 (48,437)	500 (1011)	4 (4)	2	23 (3)	76 (22)	8	5 (2)	29 (3)	30 (7)	4 (1)

\* These consist generally of small, low density scatters of lithic debris representing 1 to 24 items. They have been variously called isolated finds, minimal activity loci, or indistinct sites.

period based on the size of the stone circle. This is not considered a valid distinction now and consequently those sites were not included in Table 2. Most of the temporal assignments are on projectile point typology.

The Sly Bison site, in the Pine Breaks area near Colstrip, Montana, is an arroyo bison kill. It contains a bison bone bed associated with a processing area (Steere 1980). Points of the small side-notched type were recovered from the processing area. These indicate a great range of variation from Avonlea-like through a wide variety of side-notched types. Radiocarbon dates on associated hearths are A.D. 330-540 (1620±200: TX-3782; 1410±50: TX-3785; and 1600±100: TX-3786). Just northeast of the Pine Breaks area near Glendive, Montana, is the Goheen site which has yielded Avonlea/Avonlea-like points and ceramics. Two radiocarbon dates place the site comfortably within Period I: 1270±60 years: A.D. 680 and 1080±90: A.D. 870 (Fraley and Johnson 1981).

Avonlea and Avonlea-like points are found at sites throughout the Northwestern Plains. In Montana they are reported from all areas of the state. Most are bison kills in the northern part of the state, e.g., Wahkpa Chu'gn (Brumley 1971), Henry Smith (Ruebelmann 1981), and Boarding School (Kehoe 1967). Davis and Fisher (n.d.) discuss antelope procurement strategies of Avonlea affiliation. There is a bison kill site near Butte, Montana with Avonlea and other small side-notched projectile points which yielded obsidian hydration dates of A.D. 750-1370 and a radiocarbon date of 690±120 years: A.D. 1260 (RL-951) J. Werner, amateur: personal communication 1981). The Fisher River site in northwestern Montana contained a single Avonlea point (Roll 1979). Wortham Shelter in the Bighorn Mountains of northern Wyoming contained Avonlea/Avonlea-like

points mixed with small side-notched arrow points. The West Rosebud Lake site in the Beartooth Mountains of southcentral Montana, contained a single Avonlea-like point of obsidian for which an obsidian hydration date of A.D. 360 was obtained (Greiser and Plochman 1980:37).

#### Late Prehistoric: Period II ( A.D. 1150 to 1700)

The post-Avonlea period on the Northwestern Plains is called the Old Women's Phase by the Calgary school and the Late side-notched Arrow point tradition by Byrne (1973). The use of the phase concept at this stage of knowledge for the whole of the Northwestern Plains seems premature.

"Period II", after Byrne, is innocuous and serves to distinguish a change in projectile points from the Avonlea-like types to those with notches higher on the blade. On intensively inventoried lands covering approximately 50,000 hectares in the Pine Breaks area, sites of this period are represented by 29 of 181, or 16% of the temporally assigned sites (Table 2). The Bureau of Land Management calculates that all Late Prehistoric period sites (Periods I, II and III) represent 41% of the temporally assigned sites for southeastern Montana. The data presented in Table 2 totally support the BLM dates by being 42% Late Prehistoric. For the Indian Creek study area in the higher elevations of the Wolf Mountains in the southern Pine Breaks, 7 out of 42, or 16%, of the sites belong to this time period. Reflecting on this, L. Davis notes:

The Old Women's Phase is moderately represented by a variety of related point types. This fact, corroborated by other collections made during field studies nearby, is rather curious given the high population density and heightened mobility that are considered characteristic of the late Late Period in Northern Plains pre-history (1975a:37).



For almost all of southeastern Montana, the greatest number of temporally classifiable sites fit into the Late Archaic (1000 B.C. - A.D. 250).

In the Pine Breaks area near Colstrip, several sites have yielded information on Late Prehistoric Period II. The Old Homestead Kill site (Munson 1980) and the BLM Bison Trap (Ekland 1974) were small, possible snow drift kills with a wide variety of side-notched arrow points. At the Old Homestead Kill a single radiocarbon date from an associated hearth was  $850 \pm 50$  years: A.D. 1100 (TX-3148) (Munson 1980). Colt 45 and Horse Shelter yielded materials of the Late Prehistoric period as well (D. Fredlund 1973). The latter contained corner-notched points which were not Avonlea-like with a radiocarbon date of  $1645 \pm 120$  years: A.D. 335 (GX-2556). Colt 45 shelter contained several levels with small side-notched points varying from Avonlea to Plains types. Level III, from which most points were recovered, dates post A.D. 800. Both sites were small rock shelters in the Colstrip area. They contained bison, deer, antelope and smaller animals in the faunal remains.

Outside of the Pine Breaks other excavated sites in Montana yielding Late Prehistoric materials are, in most cases, bison kills, e.g., Wahkpa Chu'gn (Davis and Stallcop 1966; Brumley 1971), Bootlegger Trail (Roll and Deaver 1978), and English Bison Kill (Keyser 1979). There are few campsites or other types of sites which have been excavated or tested, although processing areas at kill sites have been reported, e.g., Bootlegger Kill. Table 3 lists many of the Late Prehistoric sites which have been reported in recent years. These are focused on rather than many of the older reports because of the generally more complete description of the materials found. Location is considered important because there are some specific variations in adaptive strategies on the open plains in

Table 3. Radiocarbon Dates, Projectile Point Types and Selected Data from Some Late Prehistoric Sites

Site (Author)	Location	Point Types					Site Type	Ceramics	C14 Dates A.D.	Period	Comments	
		TriN	Pla	Pra	Avon	Avon-like						Triang
Estuary Bison Pound I	SW Sask	-	-	28	-	-	1	Butcher/Process	None	930 880	I	
II (Adams 1977)		22	-	-	-	31	1	Kill & Butcher/Process	Sask. Basin	640	I	
Saamis (L. Brumley 1978)	SE Alb	-	-	190	-	-	64	Camp	Sask. Basin & Cluny	1740 1290	II & III	Historic trade goods, no tri-notched points
Ramillies (J. Brumley 1976)	SE Alb	33	-	32	-	-	12	Kill/Butcher/Process & Camp	Sask. Basin ?	985 1290	I & II	Points grouped as Prairie are classified by Brumley as Nanton, Paskapoo, Lewis, Irvine, High River. Triangular are Avonlea Tri., Plains Tri. and Catan. Mixed deposits, suggests 3 components.
Bootlegger Trail (Roll & Deaver 1978)	NC Mont	-	<u>242</u>		-	-	46	Kill/Butcher/Process & Camp	?	1300 1270- 1370	II	No triangular points in kill area, only in camp/processing area
Wortham Shelter (Greer 1978)	NC Wyo	-	2	7	<u>38</u>		-	Camp	None	630- 810	I	Greer classifies points as Avonlea, here they are merged with Avonlea-like
Wahkpa Chu'gn (J. Brumley 1971)	NC Mont	-	75	26	-	6	1	Kill/Butcher	None	30 500	I	C14 dates are on B. bone; Avon pts. include Head-Smashed-In corner-notched
Glenrock (Frison 1970b)	SE Wyo	<u>150</u>		-	-	-	-	Kill/Butcher/Process	None	1610 1740	II & III	Two levels, tri-notch pts. made up 30% of top level.
Wardell (Frison 1973)	C Wyo	-	<u>436</u>			-	-	Kill/Butcher/Process	Athapaskan ?	370 780 960	I	Early (360) date may be too early.

the north and the Pine Breaks or mountainous terrain of Montana and Wyoming. Hearth/features are broken into three types which may suggest variations in food preparation activity. Ceramic types are an important diagnostic item when found at sites, but for most reported sites ceramics are either non-existent or in such small quantities that type identification is not possible. Finally, the dates and the projectile point types are considered, for this thesis, to be of particular importance. In some cases the reports' authors, e.g., J. Brumley (1976), Roll and Deaver (1978) either classified or attempted to classify points into the varieties defined by Kehoe (1966) or Forbis (1962). However, in order to conform and be comparable I grouped their divisions into one of Kehoe's (1966) three types: Avonlea, Prairie or Plains.

## Chapter 4.

### A REVIEW AND EVALUATION OF THE PROJECTILE POINT TYPOLOGY

From archaeological sites such as Benson's Butte, Wardell (Frison 1973), Estuary Bison kill (Adams 1977), Ramillies (Brumley 1976), Sly Bison (Steere 1980), and Bootlegger Trail (Roll and Deaver 1978), it became apparent that the typology of projectile point types in common use on the Plains should be questioned. The concept of type has been discussed at length in the archaeological literature (e.g. Rouse 1960, Clarke 1968). Frison (1978:16) considers artifact types as:

...heuristic devices. They are used as temporal indicators in much the same sense that index fossils are used by the stratigrapher.

The concept of type as used here is a group of morphologically similar items which are recognized to exist over a certain period of time within a certain geographic area. A type is an ideal form. However, each type of artifact is found in various stages of manufacture, demonstrates various stages of use and re-use, is constructed by various individuals, and is made of varying sorts of materials. Recognition of specific types is often difficult because of these variations. Types can be subjected to seriation if they change with relative consistency.

Wright (1967:99-100), in discussing types in relation to Iroquois ceramics, notes the following problems, all of which are equally applicable to projectile point types:

First, the type, consisting of certain specific attributes, tends to "pigeon-hole" the individual attributes whose trends extend beyond the type, thereby disrupting the continuities in time and space... Second, the range of attribute variation within a type often results in types not being clearly exclusive from one another, thereby creating a situation where the same

sample can be classified somewhat differently by two researchers. Third, the association of attributes within a type increases the chance of researchers classifying the same sherd differently by giving different diagnostic weight to the various attributes making up the type. Fourth, the advent of new data continually demands the revisions of the established types which are closed systems and are, therefore, incapable of supporting changes which modify their original definition. And fifth, the attempts to incorporate new data into the established typology disrupts communication by creating a host of new types, revised types, and additions....

Projectile point styles of the Late Prehistoric period on the Northwestern Plains are believed to change through time in a consistent manner as demonstrated most strongly by Kehoe (1966). Much of Kehoe's data was from stratified bison kills excavated by amateurs or professionals at an early date. There was apparently little recognition of manufacturing technique and the Frison Effect (Jelinek 1977). This chapter discusses several of the problems of point typology critical to interpretation of Northwestern Plains prehistory, reviews the more recent literature and suggests revisions of the small side-notched projectile point typology.

The first problem of interpretation of archaeological data for the Late Prehistoric period is the cultural/temporal reality of the classification of small side-notched arrow points (SSNA). Are the types consistent in their change through time? Is the seriation of types consistent geographically or temporally?

The second problem is the classification of the small triangular unnotched point. For many years the triangular unnotched point form was assumed to be part of the Late Prehistoric Period II or Protohistoric. Roll (1979:94) recently classifies a small triangular point as diagnostic of A.D. 1000 to historic times. Reeves (1970), Brumley (1976) and Morgan (1979) classify varieties of triangular points as associated with Avonlea

primarily on size. Other authors have thought that they might represent point preforms, e.g., Frison (1965; 1971b) and Swanson (1972). From the analysis of the Benson's Butte materials it is suggested that the small triangular unnotched forms are most often preforms for SSNA points.

#### Small Side-Notched Arrow Points:

#### The Validity of Temporal/Cultural Variability

Small side-notched, occasionally verging to corner-notched, arrow points (SSNA) are characteristic of the Late Prehistoric period. Much has been written regarding the types, but confusion still exists. The earliest point style, Avonlea, varies in form from north (Canadian Prairies) to south (Wyoming, Colorado), but the significance of this variation is "unclear" (Frison 1978:64). The relationship of other types of SSNA points to specific time periods within the 1600 year span of the Late Prehistoric period (A.D. 150 - 1750) reflects a general change in notching height from close to the base to higher on the blade. In Wyoming and southern Montana the Protohistoric period can be readily documented by the appearance of tri-notched points, e.g., Big Goose Creek (Frison 1967a), Glenrock (Frison 1970b), and Vore (Reher and Frison 1980).

Recognition of the varieties of point types and their possible temporal association was initially noted by MacNeish (1954), expanded upon by Forbis (1962), and described in greatest detail by Kehoe (1966). Kehoe designed his system "to bring order out of the chaos" created by the large number of point types and varieties. Kehoe's system, as discussed in the previous chapter, is based on principles established

by Rowe (1959) and is characterized by tight temporal and formal controls. The system relies upon "two levels of analysis, the feature and the unit"; the latter being "clusters of attributes" or features (Kehoe 1966:827-828). After features and units have been defined selection of "significant features" occurs. These are considered to be chronologically sensitive; e.g., flaking pattern, notching, base size and shape. In the Kehoe plan variation within anyone feature is slight between the varieties, and each recognizable variation is applied to each morphological attribute or feature. For Kehoe the combination of these features determines the type or variety of projectile point. The validity of a typology utilizing this almost microscopic level of distinction, depends essentially on the significance or validity of the "significant features". Kehoe does not provide criteria from which he arrives at his "carefully" selected "significant features".

Kehoe's study is based primarily on projectile point samples from a single type of site: multi-component bison kills. L. Davis (1966:179), in examining the distribution of Avonlea, also based his work on multi-component bison kills and essentially corroborates Kehoe's scheme. The use of a specific activity site, such as a kill, to establish tool typology is restrictive, and some care must be taken when applying the same typology to other types of sites.

Another factor important to the typology of SSNA points is the apparent sophistication of manufacture.

Within the framework imposed by the overall function of the point, the makers experimented with the features affecting the subordinate functions. The ideal haft, the ideal balance, the ideal strength and penetration and the desired behavior of the point in the animal

were not constant but depended upon the species hunted and the techniques and weapons available. As these conditions altered, the ideas were modified, and the features consequently changed (Kehoe 1966: 838).

If such sophistication was actually employed in point manufacture, then to be effective it should apply equally to all parts of the projectile delivery system, i.e., the bow and the arrowshaft.

From sites such as Benson's Butte, Wardell (Frison 1973), Bootlegger Trail (Roll and Deaver 1978), Wortham Shelter (Greer 1978), and Henry Smith (Reubelmann 1981) it is apparent that the Kehoe typology, useful for its descriptive characteristics, was not always accurate in dealing with temporal distinctions. The range of variation within single component sites often included several of Kehoe's major types (Avonlea, Prairie and Plains) and numerous varieties (e.g., High River, Paskapoo). The projectile point groupings of Forbis (1962) and Kehoe (1966):

have received mixed reviews by practicing archaeologists (Reeves 1974:63).<sup>\*</sup> The failures of these schemes to receive widespread adoption among Plains archaeologists testifies to the difficulty of identifying group members (Moe et al. 1978:110).

Several schemes have been derived to seriate or differentiate these points on the basis of minor morphological variations (e.g. Kehoe 1966; Forbis 1962), but these suggested types and varieties have not been borne out by subsequent investigation as having indubitable cultural or temporal validity (Davis and Stallcop 1966:26; Byrne 1973:244). The only distinction that has any apparent temporal validity is that between Plains Side-notched and Prairie Side-notched points (Kehoe 1966), which are differentiated on the basis of notch shape (Keyser 1979:104).

For purposes of reference the three general SSNA types are defined based essentially on Kehoe (1966:829-832). Avonlea is described as having regular, often finely serrated blade edges with well-executed

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<sup>\*</sup> This reference is from Roll and Deaver (1978) and refers to an unpublished manuscript (Reeves 1974, "Head-Smashed-In: 5500 years of bison jumping on the Alberta plains").



broad, shallow, parallel flake scars. The notches are "V"- or "U"-shaped, never rectangular, placed very close to the base which is generally concave with rounded corners. The base may be slightly ground. Lengths range from 11.0 - 39.0 mm (22.0 mm is the average), widths 7.5 - 18.0 mm (13.1 mm is the average) and thicknesses 1.5 - 4.0 mm (averaging 2.65 mm). The varieties are Gull Lake "Classic", Timber Ridge, Carmichael and the transitional Swift Current.

In contrast to the well-made Avonlea, Prairie Side-Notched points are irregular in blade outline and lack quality flaking. The notches are wide, large and shallow "sometimes so low on the blade they would ordinarily be classified as corner notches". Not all have notches that low and in fact, using Kehoe's figures, the notches average .5 mm higher on the blade than the Avonlea notches. Bases are straight to concave. Lengths are 11.0 - 41.0 mm (23.0 mm average), widths 9.0 - 22.0 mm (13.7 mm average) and thicknesses 2.0 - 7.5 mm (3.5 mm average). Prairie Side-Notched varieties are Shaunavon, Irvine, Lewis, Tompkins, High River and the transitional Nanton.

Plains Side-Notched, as with Avonlea, exhibit regular blade edges with well-executed flaking. The notches are higher on the blade and the base corners are square. The bases are straight to concave and as wide or wider than the blade above the notches. Some are ground. The measurements are: lengths 10.0 - 33.5 mm (average is 22.7 mm), widths 9.0 - 18.0 mm (13.4 mm average) and thicknesses 2.0 - 7.0 mm (3.5 mm average). There are six varieties: Paskapoo, Pakiska, Buffalo Gap, Cut Bank, Washita, Billings and Emigrant. The latter two have basal notches.

The validity of the classification of the SSNA point types and varieties are examined. This is conducted by reviewing the literature and focusing on selected articles for comparison. The concept is stated as an hypothesis to be tested with assumptions upon which the hypothesis must be based. The 17 varieties are those listed above and described by Kehoe (1966).

The Seventeen Recognizably Distinct SSNA Point Varieties Reflect Temporal and/or Spatial Distribution of Specific Human Groups.

The assumptions on which this hypothesis is based are:

1. To produce 17 distinct varieties a highly developed technology is needed to maintain a high degree of refinement and consistency in manufacturing techniques.
2. The same degree of refinement would be expected to extend to the entire technological system: the arrowshaft and the bow. This discussion will focus on the arrowshaft as being exemplary.
3. The distinct types must be separated stratigraphically or spatially and be consistently within a defined archaeological component.

1. Projectile Point Consistency

The range of variation and difficulty of actually classifying points as to a particular variety or type is reflected by archaeological reports relating to many facets of the Late Prehistoric period. Beginning with Avonlea there is the "classic" Avonlea of the Canadian Prairies and the "degenerate" Avonlea or Avonlea-like of many sites in Wyoming and southern

Montana (Kehoe and McCorquodale 1961; Husted 1969). Greer (1978) classifies most (38 of 53; 72%) of the points of Wortham Shelter as Avonlea but notes that A. Johnson, in a personal communication to Greer, says they are not classic Avonlea (Greer 1978:18). The range of Benson's Butte points classified as Avonlea or Avonlea-like is similar and has received similar comments. Recent excavations at the Henry Smith site in north-central Montana, a stratified Avonlea site, produced a wide mix of Avonlea or Avonlea-like projectile points. Reubelmann (1981) notes problems in identifying varieties and using the strict Kehoe/Forbis typology. To examine the problem of internal variation within a particular stratum of a particular site I perused the literature to select single component or single incident sites and certain multicomponent sites which have been reported in sufficient detail to enable an evaluation of the range of point "types".

Forbis (1962), based on work at the Old Women's Buffalo Jump in Alberta, established the many "varieties" of types, e.g., Nanton, Paskapoo, and High River. He divides the SSNA points into seven types which change in frequency through time. The aim of this type subdivision is to develop a seriation technique for dating sites. Basically, Forbis' data support a general change in SSNA point styles through time with all types potentially represented at any given time. This same seriation is applied to the Ross site - level III, and later to Cluny (Forbis 1977) with similar results. Based on Forbis' work it appeared that seriation of the types had the potential to provide some, although limited, dating information. Forbis (1962:105) notes, however, that there are problems in the system: individual artifacts cannot be used, large samples are needed, and published information

is rarely adequate to attempt the detailed measurements. The latter point is easy to attest to by examining illustrations and classifications given to projectile point styles (see Appendix A). The drawings could easily be shuffled and differences in classification would occur. A second factor, obvious from the point drawings in the referenced figures, is that many of the points have been reworked. Most have been retipped but there is no way to know if the bases have been adjusted after breakage.

At the Bootlegger Trail site Moe et al (1978) subjected the projectile points (n=242) to a computer program based on metric and non-metric criteria of Kehoe and Forbis' selected attributes. This was designed to separate the points into groups similar to Kehoe and Forbis' types and varieties. This:

...resulted in correct assignments for 50% of the collection; the remaining 50% exhibited intermediate or different features from those grouped into established categories.

Perhaps in the instance of very large collections from specific localities the groupings created by Forbis and Kehoe have temporal meaning. Our sample is relatively small with many incomplete specimens (Moe et al 1978:110).

Greer compared the Wortham arrow points with those from the Gull Lake site (Kehoe 1973) to determine whether certain attributes change through time (Avonlea, Prairie to Plains). Kehoe notes that at Gull Lake notch depth, ear width, weight and neck width change with the different types through time. Greer (1978:23-31) finds that stem length, total length, ear width, and basal width change with the different types. <sup>She</sup> He then sets up four indices which he feels have the potential to test "directional or time change" for arrow points. Based on the results from placing the types of points into these indices, he concludes that there is considerable

overlap among all the points represented at Wortham Shelter. Since all of the SSNA points were found within:

...what appears to be, and here is interpreted as, a single-group situation, at least in archaeological terms, during the later phase occupation (Greer 1978:31).

Greer (1978:29) conjectures that the prehistoric populations living at Wortham Shelter were using several styles of points because 1) certain old and new styles were popular with different members of the group, and/or 2) the different members of the group were influenced by other people from different geographic areas. The wide range of variation of point types in this single component situation is dated at  $1230 \pm 90$  and  $1230 \pm 70$  years: A.D. 630-810 (TX-2715 and TX-2716).

Keyser (1979) in examining SSNA points from sites in the Fresno Reservoir area of northcentral Montana, found no Avonlea, but a variety of other types. He classifies them all as "triangular arrow-points" which:

...display a wide range of morphological variation in nearly every attribute; however, the fact that this variation is nearly continuous between extremes demonstrates the homogeneity of points in the category...Triangular arrow points range from 14 to 41 mm in length, 8 to 18 mm in width, and 2 to 4 mm in thickness. Some are very finely made, others are very crudely made, and most are between these extremes (Keyser 1979:104-106).

Keyser goes on to note that the Forbis and Kehoe schemes for classification would not be used and instead suggests two new categories: the High-base Deep Side-notched and Concave Base Wide Side-notched. These are essentially equivalent, respectively, with Kehoe's Plains Side-notched and Prairie types. Keyser also notes the existence of another type but does not describe it in detail. Apparently it is a rather aberrant type with convex bases as the distinguishing feature.

Although Benson's Butte is a multi-component site with mixed de-  
posits the projectile point assemblage contains certain specimens which  
are particularly pertinent to understanding the range of variation within  
a single component site. This is given in some detail for comparison to  
other sites. At Benson's Butte the SSNA points can be divided into in-  
numerable varieties, after Kehoe (1966), but are here classified as  
Avonlea or Avonlea-like (n=76), Plains side-notched (n=24), and Prairie  
side-notched (n=9). There were 177 notched fragments which could not be  
classified by type because of breakage and other defects. Although  
there was no vertical or horizontal separation of the three types in the  
deposits, the large sample yields evidence of several problems in general  
type classification: 1) the specimens intergrade morphologically; 2)  
notching is often asymmetrical; and 3) many of the points have been  
reworked by retipping or reworking the base. The degree of workmanship  
apparent on these specimens varies from a minimum of edge flaking and  
modification, to specimens which exhibit careful and complete flake  
scars covering both surfaces. Although "well-made" can be an attribute  
of any classification system, the Benson's Butte collection indicates  
that the quality of flaking appears to have nothing to do with the  
different point types.

At Benson's Butte, as well as at other other sites, the Avonlea  
type generally has notches extending forward toward the tip from the  
base, while the Plains side-notched types have notches several millimeters  
up from the base and placed straight in toward the center of the point  
(see Appendix A). The size of the notches tends to be wider and more  
U-shaped in Plains specimens, while Avonlea types have narrow and shallower

notches. A difficulty in assigning significance to minor notch attributes is that the notches are quite often asymmetrically placed. Generally, however, an asymmetrically notched artifact can be placed in one of the three type categories but would create difficulties if the variety categories were used.

Avonlea types generally have incurvate bases, while Plains side-notched types have straighter bases in the Benson's Butte sample. Notching and base shape of the Prairie side-notched type varies between that of Avonlea and Plains. Since there is a higher number of specimens with incurvate bases which were ground, it can be suggested that there is a slightly greater tendency for the Avonlea types to have a ground base. The three types from Benson's Butte were compared for material type preference as well. Seventy-five percent (75%) of the points are of local porcellanite and 3% of local NVN (non-volcanic natural glass). Cherts make up 12% and quartzite (10%). There is no distinctive variation in the frequencies of lithic materials between Avonlea, Prairie or Plains types.

Measurements of the length, width and thickness of the measurable specimens from Benson's Butte are in Table 3. The variation between Avonlea, Plains and Prairie indicate that the Plains and Prairie side-notched points from Benson's Butte average almost 1 mm more in width than the Avonlea, with the standard deviation being essentially the same for all three (1.6, 1.6 and 1.5 mm). This is at variance with Kehoe's figures where the average width is only .3-.4 mm greater between Avonlea and the other two types. At Benson's Butte Plains and Prairie side-notched are slightly thicker, being 2.6 mm and 3.0 mm respectively, while the Avonlea type averages 2.1 mm. The standard deviations are .4, .5 and

Table 4. Comparative Measurements of Small Side-Notched Arrow Points (in mm) at Benson's Butte (24BH1726). (Note: n varies with the completeness or measurability of the specimen.)

	Avonlea	Plains Side- Notched	Prairie Side- Notched	Triangular Unnotched
<u>Length</u>				
Maximum	34.0	33.0	34.0	36.0
Minimum	17.0	14.0	15.0	10.0
Mean	24.2	20.6	22.1	25.0
Standard Deviation	3.5	5.3	6.3	5.7
n =	46.0	18.0*	6.0	67.0
<u>Width Above Notch</u>				
Maximum	16.0	17.0	17.0	26.0
Minimum	9.0	12.0	13.0	10.0
Mean	13.1	14.2	14.1	15.7
Standard Deviation	1.6	1.6	1.5	2.3
n =	76.0	22.0	6.0	205.0
<u>Thickness</u>				
Maximum	3.0	3.0	4.0	5.0
Minimum	2.0	2.0	2.0	2.0
Mean	2.1	2.6	3.0	2.9
Standard Deviation	.4	.5	.7	2.5
n =	78.0	24.0	9.0	212.0

\* 10 (42%) have been reworked

(From L. Fredlund 1979: Table 10)



.7 mm. Kehoe (1966) indicates Avonlea being almost 1 mm thinner than the others. For Benson's Butte the Avonlea types average 24.2 mm in length while the Plains and Prairie types average 20.6 and 22.1 mm, with standard deviations being 3.5, 5.3, and 6.3 mm, respectively. For the Plains side notched this measurement is particularly misleading since 10 of the 18 specimens exhibit evidence of reworking of the tip. Kehoe's (1966) measurements on length indicate no more than 1 mm difference in the three types.

Length measurements are subject to many variations due to breakage and reworking of the tip and are not considered to be very valid indicators of typological variation. However, the reworking of points also causes variation in visual classification of a specimen as to type. These factors will always occur, and in many instances reworking might not be evident to persons doing the classification of the point types. Figure 4 shows some of the specimens from the Benson's Butte collection which exhibit evidence of reworking. Some have been retipped which generally does little to the form other than shorten it. Often it is difficult to discern when a point has been retipped. Rebasement takes more work since the point must be notched again. This form of reworking is most readily visible to the classifier. However, all of this tends to confuse typology.

The Old Homestead Kill site is a single occurrence kill incident (A.D. 1100). The season of the kill and the exact method of the kill remain unknown. From the kill came 112 SSNA points which can be placed into either the Plains or Prairie side notched types, most being of the former type with a wide range of variation. Much of this is from reworking of the points (Munson 1980: 34-46).

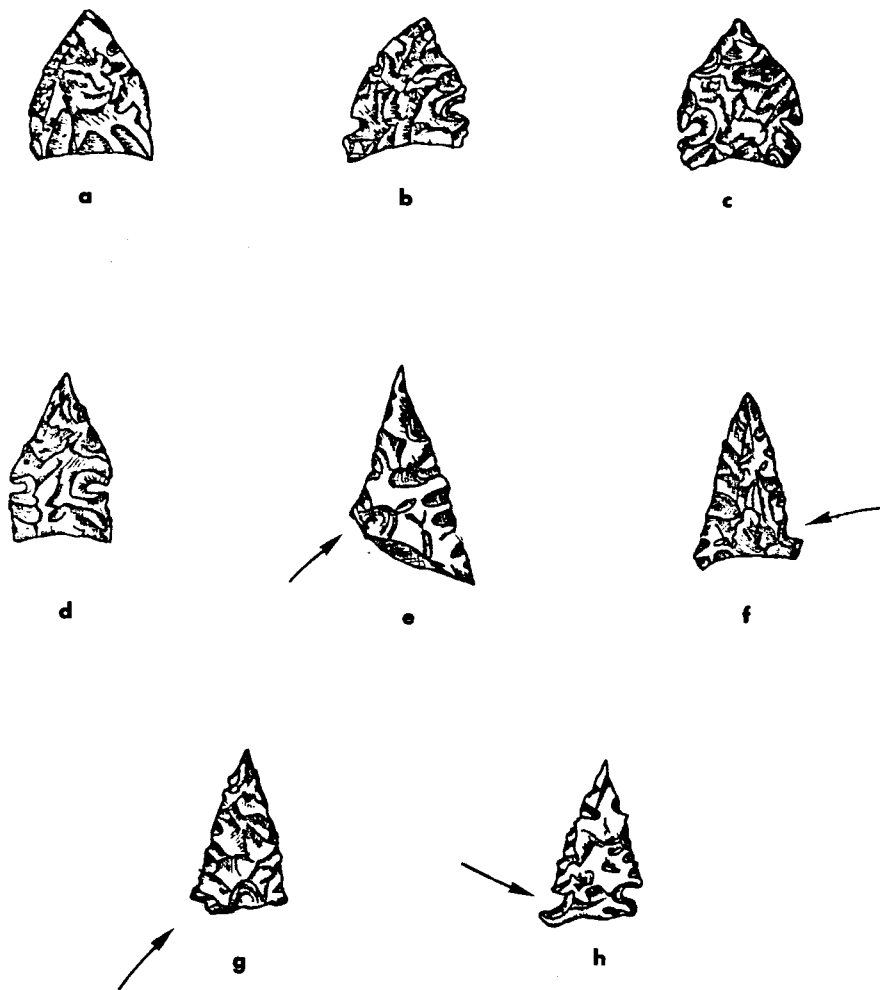


Figure 4. Examples of retipped (a-d) and rebased or renotched (e-h) points from the Benson's Butte collection. The arrows indicate new notches or attempts at notching.

In examining variation in the Avonlea type one characteristic is generally accepted: the points are better or more finely made than most of the later side-notched points. Forbis (1960:138) notes that because of the fine overall chipping and thinness of the points they have "an almost indescribable feel". At the Garrett site Morgan notes:

The majority of the Garrett Site specimens have both surfaces completely worked. Several specimens, however, required only marginal retouch to achieve the prescribed form (1978:321).

Approximately half have straight bases and half have concave bases coincident with a high degree of basal grinding on all specimens.

Kehoe (1973:75), in summarizing information on Avonlea at the Gull Lake site and comparing the results with other sites, notes that the classic Gull Lake variety dates at A.D. 200 at Gull Lake. In reviewing the Garrett site material he notes that similar points date A.D. 500. Noting this discrepancy in the dates he decides that the latter are not related to the classic Gull Lake but are "more closely related to the the nearby Avonlea type site". The Avonlea level at the type site was radiocarbon dated at A.D. 450±100:

S-45: 1500±100; 450. Charred bone...no levels of occupation occur above or below the dated material (Wilmeth 1978:100).

This temporal variability is not particularly conducive to confidence in the use of the varieties for fine chronological distinction.

At the Gull Lake site 979 points were found, 676 which could be classified into a type or variety.

The remainder of the points were too difficult to classify: some were too incomplete for valid classification, some were aberrant forms, and others showed combinations of features that were not classified easily. These last were probably transitional forms (Kehoe 1973:47).

Admittedly, at most sites a great many points cannot be classified because of breakage. However, the above quote implies that most of the remaining 31% of the points were not classified because they were "transitional". If these "transitional forms" were ignored then the measurements and results of the interpretation of the measurements are in question.

Recent analysis of the Vore site, a Late Prehistoric Period (A.D. 1450-1800) stratified bison kill, provides a positive approach to the use of the Kehoe - Forbis attribute analysis. Although not necessarily supportive of the fine breakdown into types and varieties, Reher and Frison (1980: 94-121) measured similar attributes in an attempt to distinguish variation in hunting strategies before and after the introduction of the horse. The results were only slightly suggestive of hunting pattern changes. However, information on population movement patterns was suggested by the data. The significance of the Vore site analysis to this discussion of typology is that variations in point types in carefully controlled situations at single sites can provide site specific information; however, an attempt to temporally and culturally use the type-variety over the Northwestern Plains is not a viable objective.

To illustrate the range of variation in Late Prehistoric projectile points the outlines of illustrations from several sites are provided in Appendix A. They are included to exemplify the numerous variations in form which can occur at each site and to provide a reference as to types through time. Rather than use photocopies or photographs it is felt that the outline tracings will provide a relatively unbiased morphological approach to show the many varieties.

In examining the various components associated with the SSNA type points for most of the Late Prehistoric period, it appears that, as the data base increases the validity of the fine breakdown hypothesized by Kehoe and Forbis is not being corroborated by well controlled site excavations. Single component and multi-component sites with well-dated strata limited to a relatively small temporal span, e.g., Bootlegger Trail and Estuary Bison Trap, are generally revealing a great range of variation in point types through time. When dealing with actual manufacturing technology it is possible that a skilled flint knapper could place notches accurately most of the time to produce a very consistent series of SSNA points. Following Kehoe (1966:838), Reher and Frison (1980:102) suggest that some variation in point type might be prey species specific. In other words, if bison is to be the primary animal hunted that day or in that area a specific type of tip would be preferred. For hunting antelope slight modifications might be made. In general, the evidence from the above sites indicates either that consistency was not important, or that the points were made by a variety of individuals who, as humans, had varying degrees of skill and various technological or aesthetic preferences.

## 2. Consistency of the Arrow Shaft

Although a shift in notching along the blade of the point will have little effect on the shooting performance, the implication that the fine variations in point tip are significant to typology makes one expect similar refinement in the arrow. Not that changes in weight from variety to

variety would be great enough to cause the arrow to stray from its target, but that the fineness of one part of the technology would be expected to be found in the other, i.e., arrow tip and arrow shaft. A brief review of the literature regarding arrowshafts from archaeological context indicates that arrowshaft dimensions have considerable variation.

Based on the materials from Pictograph Cave, Mulloy (1958:61) notes that "excellence of the shaft is quite variable, some being almost perfect cylinders while others are irregular", and that while the wooden arrow shafts are quite uniform in diameter, "the length of the finished shaft is uncertain". Feathering location also varies from 0.4 - 1.0 inch (10.0 - 25.0 mm) from the end of the shaft and length of feathering varies from 4.1 - 5.6 inches (104.1 - 142.2 mm) (Mulloy 1958:64).

At Wickiup Cave 16 arrow shaft fragments were recovered, and these varied from .25 - .75 inches (6.3 - 19.05 mm) in diameter (C. Davis 1975:301). Davis notes that the specimen with the greatest diameter may not be an arrow shaft and this would alter the diameter range. However, a variation in diameter of a quarter of an inch would certainly influence the base size and notching of the projectile tip to be attached.

Lookout Cave, a rockshelter in the Little Rockies of Montana, yielded a large number of arrowshafts. Originally reported by Barnier (1969), subsequent excavations and more detailed analysis was conducted by Burt Williams. Williams (personal communication 1978) reported that there is a substantial difference in the arrowshaft diameters from this site.

Arrowshafts with diameters ranging from 6-10 mm were recovered at Wortham Shelter in the Bighorn Mountains of northern Wyoming (Greer 1978).

He corroborates Mulloy's earlier comments in some detail, as he notes considerable variation in nocks, sinew wrapping, the length of feathers, and the location of the fletching on the shaft. Similarly, Hursts (1978: 468) in an intensive study of both arrow and atlatl shafts, concluded that there was a "relatively low degree of correlation between arrowhead and arrowshaft size".

From the above information it is apparent that there is a considerable range of variation in arrowshaft diameters, and the length and location of the fletching. These variations reflect either a general apparent lack of perfection in the manufacture of the shafts, suggesting a great tolerance in performance capability, or a great range of functional variability. The variations are of great enough magnitude to effectively negate any advantage which might be gained from extreme refinement of projectile points as considered significant to the typology by Kehoe.

### 3. Stratigraphic Separation

Increase in the data base for well-dated, non-bison kill Late Prehistoric period sites has yielded some interesting theories regarding the SSNA system. The most significant thing is that these sites have greatly expanded the previously established temporal range for Avonlea and Avonlea-like points. Byrne (1973) suggests that there is a greater percentage of Avonlea types during a period ca. A.D. 200 to 800 but not to the exclusion of other notched forms. Davis and Fisher (n.d.:Table 4) note 12 sites with radiocarbon dates which place Avonlea materials in a later time period than that noted by Kehoe. The radiocarbon dates

compiled by Davis and Fisher (n.d.:Table 5) are from sites throughout the Northern Plains, including Benson's Butte which is classified as "late Avonlea phase". Using corrected radiocarbon dates this late Avonlea phase ranges from A.D. 730-1140. Kehoe (1973:50) classified Avonlea points as ranging at the Gull Lake site from A.D. 210-660; Prairie Side-Notched from A.D. 730-1250, and Plains side-notched from A.D. 1590-1773. At Benson's Butte, eight out of ten dates fall between A.D. 700-1000. At Wortham Shelter the single incident Late Prehistoric occupation contains Avonlea, Avonlea-like, Prairie and a single Plains side-notched type with an associated radiocarbon dating range of A.D. 630-810. The Wardell site yielded three radiocarbon dates: A.D. 370, 780 and 960. It contained side-notched and some Avonlea-like projectile point types.

The Bootlegger Trail site is multi-component with well-dated occupations which occurred within 100 radiocarbon years of each other. In discussing the point types it is noted that:

Since the sample appears to represent occupations closely related in time, there seems to be little reason to rely on the established categories. Instead we choose to describe our sample as two forms, side-notched projectile points with a wide range of acceptable variations and an unnotched projectile point form...

A truly wide range of forms characterizes the sample of side-notched projectile points. The range present in any one area or cultural level also appears in the others....The projectile points from Bootlegger seem to form a single, however variable, population (Moe, et al. 1978:112-113).

From the Sly Bison site (Steere 1980) most points were recovered from the butchering/processing area. The range of SSNA points is considerable. The kill area has not been excavated but it was expected to yield points with a similar range of variation. The outline of the SSNA point collection



is in Appendix A. Radiocarbon dates from the Sly Bison site are A.D. 330, 350, and 540.

Adams (1977) reports two stratigraphic levels at the Estuary Bison Kill. Level I had a radiocarbon data of A.D. 880 - 930 and Level II A.D. 640. In a preliminary statement on the site Kehoe (1973:164) describes the Estuary Kill as containing Prairie and Avonlea type points. Adams notes the many varieties after Kehoe but classifies all the points as Prairie side notched.

Table 3, p. 55, describes point types recovered and associated radiocarbon dates for a variety of excavations relatively recently conducted on the Northwestern Plains. The dates indicate either a mixing of types or a great confusion in the recognition of such types by the researchers.

### Summary

The hypothesis that there are 17 distinct and recognizable point types which change in a predictable manner through time and space is not upheld. Rather recent data support Byrne's concept that there is a greater tendency to find Avonlea or Avonlea-like points between A.D. 200 and 1000, and a greater tendency to find Plains Side-notched or High-base Deep Side-notched (Keyser 1979:104-106) in Late Prehistoric Period II, but not to the exclusion of all others. The following statements summarize the evidence:

1. There is a tendency for points to change from the Avonlea type (thin, well-made, points with shallow notches) to a Prairie type (slightly thicker, more rounded base with large notches) to the Plains type (high squared bases and deep notches, often tri-notched in the later part of

the Late Prehistoric period).

2. All three types can be found on a single site, within a single component, or level. This does not necessarily reflect different cultural groups of different temporal affiliations.
3. Kehoe's 17 varieties are useful for descriptive purposes and provide a standard for measurement of projectile points for a variety of interpretive purposes.

The exception to the above is that in certain situations, evident at certain sites, there is not a great variation in point types (or varieties). It is suggested that this is a site specific phenomena and reflects a strategy for a planned scheduled activity. In these situations the primary artifact types (at kill sites weaponry would be most readily and carefully prepared) would be consistent and finely made. The Scheduled Hunting Activity Hypothesis was suggested for certain components at the Big Creek Lake site (L. Fredlund 1980:115-116) which reflected special preparation for a planned mountain hunt rather than an unplanned fortuitous encounter of any number of prey species. The Vore site and certain components of Gull Lake site exemplify this internal consistency in the projectile points. Reher and Frison (1980: 127-135) relate this concept to "gearing up" by collecting large amounts of specific lithic materials in preparation for bison kills. The variation in point types simply reflect the amount of preparation (time and energy) given to the kill. If there were a long time for this preparation, the point styles might be more consistent than if the kill incident was generally fortuitous. If there were time and assurance that the kill would occur, the expert projectile point makers in the group might make most of the points. If further study supports this contention the cultural processes implied are considerable. Thus, the Scheduled Hunting Activity Hy-

pothesis can account for great internal consistency in the projectile point assemblage as an exception to the wide range of internal variation in a single component. The significance is that it does not support the splitting of types to account for cultural changes across space and time. Rather it provides a means of defining between planned and fortuitous activities; a possible key to the Explanation Stage. Thus, internal consistency of point types is a functional criteria rather than a temporal or cultural distinction.

## The Small Triangular Biface Form

The triangular unnotched biface form or triangular unnotched "point" has been noted by researchers for much of prehistory. Swanson (1972:107) discusses the Bitterroot Preform of ca. 7000 years ago from east central Idaho. Lobdell (1973) describes the use of triangular forms in a bison kill site of the McKean complex, ca. 2000 B.C., in southern Wyoming. Reeves (1970) and Clark and Wilson (1981) note triangular forms associated with Pelican Lake bison kills in southeastern Montana. Most of these early triangular forms are fabricated from prepared blanks, not flakes. Of primary interest here, however, is classification of the unnotched triangular form which was fabricated from a thin flake during the Late Prehistoric period on the Northwestern Plains.

Small unnotched triangular forms have long been considered by many archaeologists as a distinct projectile point type. From the cultural materials recovered from Signal Butte and Ash Hollow Cave, Strong (1935) and Champe (1946), respectively, considered unnotched triangular forms to be projectile points distinct from associated side-notched types. Based on materials from Signal Butte, Ash Hollow Cave and other surface sites Wedel (1949:333) assigned the small unnotched triangular forms to the Protohistoric Dismal River complex. Because of Wedel's classification triangular forms on the Northwestern Plains were, for many years, thought to be only associated with the Late Prehistoric Period II and Protohistoric periods. Based on the above literature and other work, archaeologists began noting subtle differences in the small unnotched forms. These distinctions were morphological and based primarily on size and "crude-

ness" (the latter being a difficult trait to describe or evaluate). As a result of this attempt at finer classification a plethora of unnotched points were named. MacNeish (1954:38) recovered "Plains Triangular" unnotched points from the Stott Mound and Village Site in Manitoba. In the Bighorn Canyon of southern Montana, Husted noted Avonlea points associated with unnotched triangular forms:

Crudely fashioned triangular projectile points were associated with Avonlea-like points in Sorenson VI, the Barry's Landing site and several other small sites... There is no question concerning the association of the two point styles; however, whether the triangular form occurs near the beginning or the end of the period during which Avonlea-like points were in use remains to be established. Data from small, yet to be reported sites, suggest that the triangular points were used late in the Avonlea-like period (Husted 1969: 95).

By 1972, Reeves (1972:150) identified Avonlea Triangular and Catan Triangular, while Morgan (1979) identified Avonlea, Prairie and Plains triangular points. Mulloy (1942) was reluctant to classify these triangular forms at the Hagen site. The concept of the triangular form as a preform, not a finished point, was entertained by Mulloy (1942:95). However, on the basis of the occasional presence of post-contact European materials at the Hagen site, Mulloy (1942:143) finally classified them as a point type belonging to the Historic or Protohistoric period.

Other researchers have generally assumed that the triangular unnotched forms were preforms. At Spring Creek Cave, a single component Late Archaic period site in Wyoming, Frison (1965) recovered unnotched triangular forms in context with large corner-notched styles. Frison suggested that some appeared to be unfinished while others were finished except for the notching. Similarly, at the Late Prehistoric period Eden-Farson site, Frison (1971b:270) reports unnotched points he believes to

be "unfinished", in context with small side-notched and triangular-notched (side and basal notched) arrow points. The same three types, side-notched, tri-notched and triangular, were reported at Wickiup Cave, a single Protohistoric occupation site in southwestern Montana (C. Davis 1975:305). Although not stated in his original report, Davis considers the triangular forms from Wickiup Cave to be preforms for the notched points (C. Davis, personal communication, 1979).

In describing Desert Side-notched points from Hogup Cave, Aiken (1970:33) notes that the points were "made from a triangular preform that was not constricted or rounded at its base", whereas Rose Spring points were made on preforms with rounded bases. He recognizes another point type, Cottonwood Triangular, which are slightly larger in size compared to the notched types.

Points of the Desert side-notched and Eastgate expanding stem types are basically triangular with broad bases, and both could have been made from broad-based triangular preforms that would resemble, if they are not the same as, those points herein designated as Cottonwood triangular (Aiken 1970:51).

In the Bitterroot Mountains of Idaho (and southwestern Montana) Swanson examines a similar problem related to the Desert Side-Notched arrow points:

If the Beaverhead A is a preform for the Bitterroot point and the Beaverhead B for the Desert Side Notched in Birch Creek, then there may be other preforms for better finished points which have not been recognized by archaeologists. (Swanson 1972:107)(Emphasis is mine.)

Morgan (1979:340-342) suggests that the unnotched forms were used as cutting tools but notes:

Absence of wear patterns is the major weakness in the above functional analysis. The thinness of the tools implies limited endurance and thus short-term useability. Breakage may have occurred before use patterns become physically distinguishable.

From the literature it appears that there is a problem in the identification and interpretation of small triangular forms. In order to examine the problem it is stated as an hypothesis, and then assumptions are listed as an "if then" situation. The hypothesis to be tested is:

Small Triangular Biface Forms Are Preforms.

The following statements are the tests of the hypothesis:

1. Preforms would occur in campsites where projectile point and tool manufacturing was conducted. Preforms would not occur at bison kill sites, since projectile point manufacture would rarely be an activity associated with the actual kill-butcherer process.
2. Preforms would occur throughout the span of the small side-notched arrow point (SSNA), ca. A.D. 150-250 through the early Historic period.
3. Preforms would exhibit greater variation in size, shape and "crudeness" than finished points would. It follows then that the final stage manufacturing technique for the points could be described, providing insight into the significant physical characteristics of the point at various stages of manufacture.

1. Campsites, Bison Kills and Triangular Unnotched Forms

The following review of the literature is of bison kill sites and occupation/campsites from Wyoming, Montana, Alberta, Saskatchewan and Manitoba. Most of the sites produced significant numbers of projectile points. Kill sites are assumed to be generally singular in purpose with activities centering on the killing and primary butchering of bison. As

has been indicated by numerous excavations the processing of the meat (e.g., jerking, fine butchering, hide preparation) takes place away the major kill area. Rarely are tools other than those directly connected with the specific task(s) recovered. Artifacts recovered from kill sites are butchering tools and projectile points. At the Glenrock site, for example, recovered artifacts included: bone tools made from the butchered bison, 82 water-worn cobble tools, tools made from large percussion flakes, four plano-convex end scrapers, sharpening flakes (generally not more than 30 ft (9 m) away from the parent tool), a buffalo horn sheath pipe, and 152 projectile points (Frison 1970b). Campsites, on the other hand, reflect a variety of daily activities (e.g., food preparation, shelter remains, tool and clothing maintenance and manufacture) and an accompanying diverse assortment of tool types. Among the daily activities often associated with habitation sites is the production and finishing of projectile points, an activity not usually occurring at kill sites. Benson's Butte, for example, contained a great variety of tools and projectile points in various stages of manufacture (L. Fredlund 1979).

Kill Sites. Bison kill sites on the Northwestern Plains characteristically contain large numbers of projectile points. H.P. Lewis, an amateur collector in Montana, accumulated a collection of projectile points from 14 kill sites. Although not giving quantities of points, Lewis (1947: 27) states:

...a small percentage of the points of this collection are completely without the usual stem or notches for attaching to the shaft, but the overwhelming majority have a notch on each lateral edge, near the base.

Only at the Cashmen Site does Lewis observe unnotched triangular forms to be dominant. He also reports scrapers and bifaces as being more abundant



than in other sites; all of which suggests a butchering/processing area rather than just a kill. At the Bootlegger Trail site unnotched triangular forms are associated with the butchering/processing area. Roll and Deaver (1978:46) note that the "unnotched forms were virtually absent in the kill". They record one specimen.

Twenty bison kill sites are reviewed in Table 5. These sites were subject to various stages of archaeological investigation from extensive collecting or testing to full scale excavation. Collectively these sites yielded a sample of 3389 Late Prehistoric period projectile points. Of these 74 (2.1%) were unnotched triangular forms. Some sites had kill areas and separate butchering/processing areas, e.g., Bootlegger, Piney Creek and Ramillies. From the butchering-processing areas of these three sites, 62 of the 74 triangular points were recovered. If the points from these butchering/processing locations are dropped from the above sample the percentage of triangular forms is reduced to .3% of the total sample. Based on the extremely low frequency of triangular unnotched forms in bison kills, it can be stated that they do not play an important role as a tool type in bison kill sites. This is not to say that the triangular form is never used as a projectile tip for bison killing in the Late Prehistoric period, but that it is rare occurrence.

Camp Sites. In reviewing the frequency of triangular points at camp-sites Shumate (1967:12) notes that "such points are rarely found other than in the immediate vicinity of campsites". Sixteen base camps (Table 6), some of which are associated with kills, are examined. These sites provided a total of 3342 projectile points. Of these 831 (24.8%) are triangular unnotched forms and 2511 are SSNA points. This suggests that the triangular unnotched forms are relatively common at campsites.

Table 5. Some Late Prehistoric Bison Kill Sites with the Quantities of Notched and Unnotched Points Recovered.

Site	Unnotched Points	Notched Points	Comments
Taft Hill Buffalo Jump (Shumate 1967)	5	183	multi-component
Salsbury Bison Kill (Hoy 1973)	0	45	multi-component
Saco Kill (Hoy 1973)	0	28	multi-component
24PH602 (Hoy 1973)	0	76	multi-component
Ten-Twenty Bison Kill (Hoy 1973)	1	31	single component
Wahkpa Chu'gn (Davis and Stallcop 1966)	1	107	multi-component
Piney Creek (Frison 1976b)	6	195	single component
Gull Lake (Kehoe 1973)	0	979	multi-component
Estuary Bison Trap (Adams 1977)	0	55	multi-component
Bootlegger Trail (Roll and Deaver 1978)	46	242	multi-component
Old Homestead Kill (Munson 1980)	0	87	single component
Three Buttes Kill (Brekke 1970)	0	88	single component
Wardell Buffalo Trap (Frison 1973)	0	436	multi-component
BLM Bison Trap (Ekland 1974)	0	24	single component
Foss Thomas (Fry 1971)	1	97	single component
Glenrock (Frison 1970b)	0	152	multi-component
Boarding School (Kehoe 1967)	0	213	multi-component
Kobold (Frison 1970a)	2	123	multi-component
Emigrant (Arthur 1962)	2	88	multi-component
Ramillies (Brumley 1974)	<u>10</u>	<u>66</u>	multi-component
Total	74	3315	

Table 6. Frequencies of Unnotched Triangular Forms and SSNA Point in Certain Late Prehistoric Period Base Camp/Occupation Sites.

Site	Triangular Unnotched Forms	SSNA Points	Reference
<u>Multicomponent</u>			
Pictograph Cave III	41	678	Mulloy 1958
Birdshead Cave IV-VI	8	9	Bliss 1950
Daugherty Cave	20	29	Frison 1968b
Myers-Hindman	5	93	Lahren 1976
Signal Butte	80	85	Strong 1935
Ash Hollow Cave	74	53	Champe 1946
Benson's Butte	316	286	L. Fredlund 1979
Stott	22	100	MacNeish 1954
Wedding of the Waters Cave	8	10	Frison 1962
Garrett 1,2 & 6	37	40	Morgan 1979
<u>Single Component</u>			
Eden-Farson	59	338	Frison 1971b
Lookout Cave	0	46	Barnier 1969
Shippee Canyon	41	81	Joyes 1973
Upper Sanger	25	44	Stoutamire 1973
Happy Hollow Rock-shelter	35	29	Steege 1967
Hagen	42	562	Mulloy 1942
John Gale	18	28	Miller 1974
Total	831	2511	

The deposit at Benson's Butte strongly supports this idea. The large number of triangular forms and SSNA fragments relative to other tools suggests that projectile point manufacture was a major activity at the site; 316 triangular unnotched forms and 286 SSNA points (complete and fragmented) were recovered. Another 245 tip fragments from these small points/preforms were found. Although these numbers include fragments identifiable only as being from a thin bifacially worked item, they make up 50% of all the chipped stone tools at the site.

Summary. Based on the above data it is apparent that the triangular forms are common to camp sites and essentially absent in kill sites of the Late Prehistoric period. This strongly supports test #1 of the hypothesis that these triangular forms are not found in kill sites but only at campsites where manufacture or maintenance of projectile points would be expected to occur.

## 2. Temporal Association of Triangular Forms

Although not interpreted as such by most researchers today, the triangular form was once commonly believed to be chronologically associated with the Late Prehistoric Period II, Protohistoric, and early Historic periods. This concept is apparently based on Wedel's (1949) interpretation of Strong's (1935) work at Signal Butte and very probably on the influence of relatively well-known data concerning Mississippian triangular points. The stratigraphic sequence at Signal Butte consisted of Level I (the McKean level), Level II, Level III and Level IV (the Protohistoric level). The boundaries of Levels II and III as described in the report are somewhat unclear. However, Wedel assigns the triangular unnotched forms from

Level III to the Protohistoric Dismal River horizon, and the side-notched points to the Upper Republican horizon. Wedel (1949:333) states that this temporal assignment is based on "finds elsewhere". The fact that the Protohistoric Level IV at Signal Butte was stratigraphically separate from Level III, and that no triangular forms were found with the trade beads in this level is confusing.

Unlike the Signal Butte deposits, at Ash Hollow Cave there was stratigraphic separation. Associated ceramics confirmed the stratigraphy. Triangular unnotched forms (NBA) and Late Prehistoric SSNA points designated NBA 1 and NBA 2 were mixed within these deposits. The ceramic sequence begins with Woodland type ceramics in lenses C/D, D and E, followed by Republican associated ceramics in C, and B with Dismal River ceramics in lens A (Champe 1946: Figure 9). There was no stratigraphic separation of notched vs. unnotched "points".

The remaining multi-component sites examined contained triangular forms associated with various SSNA points throughout the Late Prehistoric sequence. Brumley (1976) at Ramillies, for example, recognized three types of triangular points associated with the prehistoric sequence: Avonlea Triangular, Plains Triangular and Catan Triangular. From the above information and associated radiocarbon dates as at Benson's Butte, it is obvious that triangular points are associated with the total sequence of point styles during the Late Prehistoric, and not to just the terminal portion of the period.

### 3. Variation in the Triangular Form

At the Eden-Farson site, a Protohistoric Shoshone single use campsite in Wyoming, Frison (1971b:269) notes workshop areas that he attributes to projectile point fabrication. Although this site is culturally associated to the protohistoric Shoshone it is illustrative of the variation in points within a single site. The projectile points recovered from this single use camp are of several types: predominant are side-and basal-notched (tri-notched), side-notched, and triangular unnotched points. A wide range of variation exists in the attributes. Blade and base edges range from straight to convex, while side- and basal-notched range from being carefully made to those where the notching is no "more than lateral restrictions" (Frison 1971b:270).

Forbis et al (n.d.) provide a detailed analysis of Signal Butte materials. They classify the unnotched triangular forms as Fresno points and the side-notched points as Reed points (Forbis et al n.d.: 22-23). Measurements on the two types are very close. Reed points measure 10 - 29 mm long and weigh from .3 - 1.0 g. The length/width ratio is 2:1. The Fresno point measures 17 - 36 mm long and weights .4 - 2.8 g. It has a length/width ratio of 1:1 to 3:1. The Fresno point appears to be generally unfinished, commonly exhibiting blade surfaces retaining portions of the original dorsal and ventral flake surfaces. Retouch is often confined to the blade edges. The Fresno point (triangular form) exceeds the Reed point (side-notched form) in size and weight. The above attributes would be expected if the Fresno "point" is a preform for the Reed point, and not a separate type in itself. The descriptions given and the other information regarding these two points suggest that

the Fresno is, indeed, a preform for the Reed point.

Morgan in discussing 29 Avonlea Triangular points from the Garrett site notes that:

These specimens, with minor variations, exhibit a high degree of similarity to the Avonlea type, especially in their symmetry, exceptional thinness, and high quality of workmanship... One variation from the notched form is a reduction in degree of surface modification. Of the specimens that could be analyzed, 58% had one surface completely worked and one surface marginally re-touched...

These specimens are primarily plano-convex in cross-section... Other variations in the notched form include: (a) grinding restricted to 2 (11.6%) of the specimens; and (b) straight bases (1979:323).

A type with a small ear-like projection at both base corners is considered "unclassified" by Morgan (Ibid.). It is probably a stage of a preform rather than a new type.

In examining Plains Triangular forms Morgan (1979:267) has a sample of eight.

Attributes shared with the notched form include: general outline, degree of surface modification, poor quality of flaking, and lack of symmetry. Differences from the notched form also have been distinguished: the average metric attributes of length and width are greater; the majority of the bases are straight; and there is no evidence of basal grinding.

As noted above, Reeves and Brumley recognize three distinct triangular point types. While the samples recovered by both Reeves and Brumley are too small to have statistical value, the descriptions are important since they tend to support the assumption that the triangular forms are indeed preforms, rather than point types. The weights and measurements given for Plains Triangular and Avonlea Triangular are very similar to the measurements of their notched counterparts. The Catan point, however, is thicker and not as refined in workmanship. The Catan attributes are suggestive of an early stage of preform fabrication rather

than a distinctive "point" type.

When all measurements on width and thickness for the triangular un-notched and notched forms are compared, the triangular forms tend to be thicker, wider and slightly longer. The measurements from the Benson's Butte sample (Table 4, p.69) corroborate this. The standard deviations are far greater than the comparative measurements for the notched points. This variation is to be expected if the triangular forms are indeed preforms. The larger size and weight reflects different stages in the manufacturing process.

At Benson's Butte this variation in size and "crudeness" is evident:

1. The triangular forms and the notched points are present in similar distribution horizontally and vertically throughout the deposits, most specimens being within the top 30 cm.
2. All stages of the manufacturing process are in evidence (and are described in the next chapter).
3. The examination of break fracture patterns in the triangular forms reveals a complete absence of impact fracture breaks in the sample unit of 100 specimens. In all cases, breakage appears to be from bending-related stress, probably generated from pressure flaking during the manufacturing process. (These determinations were based on criteria established by Ahler 1970). The lack of impact fracturing suggests that these triangular points were NOT generally used as projectile points.
4. No edge wear indicating secondary use is apparent on the lateral blade edges of the triangular forms.
5. The triangular specimens exhibit almost identical morphological measurements with the notched specimens with one exception: the average



triangular form is generally slightly larger than the notched points in length, width and thickness (Table 4). Also the standard deviations of the same measurements for the triangular types are greater, as would be expected for unfinished items or preforms.

### Summary

All of the tests for the hypothesis have been shown to be positive. Based on a review of the literature it is apparent that small triangular biface forms are, in most cases, preforms for Late Prehistoric small side notched arrow points. The stated assumptions are all supported by the data: preforms do not frequently occur at kill sites, but more often at base camps where tool manufacturing takes place; preforms exhibit greater variation in morphology, weight and "crudeness" than finished points; and preforms occur throughout the Late Prehistoric period in association with SSNA points. This does not mean that the triangular unnotched forms were NEVER used as projectile points, but that the use of them for such was a rather rare occasion during the Late Prehistoric period on the Northwestern Plains.

The significance of defining the triangular form as a preform, not an arrow point, is that the artifact is recognizable in its various preform stages. This provides the archaeologist with another artifact which is temporally and functionally specific. Temporally it is considered part of the Late Prehistoric period based on its size. (Triangular forms are reported for earlier time periods, but they are generally recognizable because of their larger size and that they are not made on thin flakes.) Functionally, it infers that one of the activities occurring at the site

of its recovery is arrow point manufacture, at least the initial stages.

Whether this same concept is applicable to other areas, e.g., the Great Basin, the southern Plains, is not known. Review of the literature suggests it might apply but detailed analysis of site specific data and study of specific collections must be done to reveal its relevance to these regions. Any such study must of necessity include a variety of site types and not at specialized activity sites.

## Chapter 5.

### THE MANUFACTURE OF SMALL SIDE-NOTCHED POINTS: THE EXPANDING FLAKE POINT TRADITION

There is evidence that the bow and arrow was in use, albeit limited, in the Great Basin several thousand years prior to its general appearance on the Plains. Morgan (1979:212-213) even suggests that the bow and arrow was in use by Besant groups before the appearance of the Avonlea point in the Northern Plains as evidenced by the occasional occurrence of the Samantha point, a small corner-notched type. Within several hundred years, and with no evident transition, the bow and arrow became the primary projectile delivery system on the Northwestern Plains. The question is why the popularity of the bow and arrow increased so dramatically in such a short time span. Although it is doubtful that there is a single cause, a technological advancement and a subsequent radical change in manufacturing process is one suggestion. This is hypothesized to be a process of rapidly producing numerous arrow points in a relatively short time. Instead of making projectile points from a blank, distinctive thin expanding flakes were relatively mass-produced. This process is here called the expanding flake point tradition and the discussion is modified from L. Fredlund and D. Fredlund 1979:77-92.

A cultural tradition, as seen by Willey (1966:4), is a cultural grouping which can be discerned in a geographic area and within a certain time span. He was concerned with major cultural traditions throughout the New World and felt that these were "characterized by a definite patterning of subsistence practices, technology, and ecological adaptation" (Willey 1966:4). The flake point manufacturing technique and the accompanying use of

the bow and arrow is a tradition in the sense that it replaced a previous weapon system, forced adaptations in hunting methods, and probably engendered social changes.

The main questions are, of course, why the rapid change to the bow and arrow and why not sooner? The ability of craftsmen to produce extremely fine chipped stone tools is certainly exhibited by earlier Archaic tools. Both the arrow tip and the bow could unquestionably be fabricated with little difficulty. Also the advantages of the bow and arrow weapon system would presumably have been known. Some of the obvious advantages, in comparison to atlatl and darts, are that there is potential for greater accuracy, accuracy is greater over a longer distance, there is less movement by the archer when releasing and "reloading", the speed of the missile is increased and the weapon can be more rapidly "reloaded". The ballistics of the dart are that it relies more on its weight for impact penetration on the prey whereas the arrow relies on its velocity for penetration. The reticence to change to what appears to be a "better" system is based undoubtedly on the conservative nature of people and on some very practical reasons which have been obscured by time. Although certainly constructed prior to the appearance of the SSNA flake points in the Plains, the few arrow tips may have been manufactured by a much less efficient method and, consequently, the use of the bow was not considered to be a practical tool. The hypothesis presented here is that efficiency in production, less time and energy in manufacture and less time and energy to acquire materials, is a successful key to the change.

The importance of viewing all SSNA points as part of a manufacturing and technological tradition of the Late Prehistoric period on the North-

western Plains is directly related to 1) noting the distinct difference in manufacturing procedure for technologies related to the Archaic period, 2) accepting the triangular form as a preform for the notched points and 3) viewing the notched points, not as isolated types or varieties, but as variations within this single tradition. The points must be looked upon as part of a continuum of manufacturing and attrition with the whole process directly related to associated adaptive strategies. The food procurement strategies are obviously designed to kill animals in order to provide the largest possible yield of useful products for the smallest possible expenditure of energy and material.

#### The Archaic Point Tradition: Some Inferences

Little, if any, detailed study of Late Archaic or Besant manufacturing techniques exists so the following statements are inferential and are based on replication and examination of the dart points. This section is not to be considered a definitive statement on Archaic point technology. Rather it can be a basis for understanding the changes which produced, or processes which were necessary for the later SSNA point manufacturing sequence. Archaic projectile tip manufacture began with the removal of a blade flake from the core, probably by striking the core with a hammerstone. Callahan (1979: Figures 11-12) illustrates these blade flakes and indicates they can be made from prepared or unprepared cores. These blade flakes were then reduced by billett and pressure flaking into the desired shape.

The resultant points are characteristically larger and thicker than the SSNA types. At the Big Creek Lake site the two predominant point types (variants of Late Archaic types) exhibited a wide range of variation in size because of breakage and apparent secondary use as butchering tools (L. Fredlund 1980). After the reduction of the blade flake to the ideal form, the notches were formed by "pull" flakes (Herbort, personal communication 1981), thus forming the characteristic circular scar as evident in almost all Middle and Late Archaic points. Pull flakes, as opposed to "push" flakes, are described by Patten (1978:4) as having at least the following: "expanding sides", "fat scars", "low ridges", "prominent bulb", "compression rings with expanding radii", and "rounded median". They are fabricated when the stone or pressor (pointed knapping tool) is loosely supported, by the force of the pressor being away from the fracture at a 90° angle or greater, using simple platforms with fast detachment and a dull pressor. This is in contrast to "push" flakes which have "parallel sides", "long, narrow scars", "feathered termination", and generally lack a bulb of percussion. These are made by having a steady support for the stone and pressor, the force of the pressor is in the direction of the fracture on the prepared "segregated platform", and the knapping is done with a relatively fine pointed pressor. Examples of notching flakes have been recovered from the excavation of Engineers Shelter in southeastern Montana in association with features dating to the Archaic period (Herbort 1981b). The primary points of distinction between the evident results of the manufacture of Archaic and SSNA points are in the notching, in the use of an initial blade flake and a generally thicker final result.

Production of larger points is more material consuming than that needed for the smaller arrow points and may, in some areas with a paucity of available raw material, have been a reason for the change to the bow. The time and energy needed to acquire enough cryptocrystalline material to produce large numbers of tools is considerable, even for the SSNA points. However, smaller pieces of material and smaller cobbles could be used when necessary. Present limited evidence from western Montana regarding extensive underground quarrying activities of cryptocrystalline rock is somewhat suggestive, based on radiocarbon dates and point typology, that this "mining" was more intensive in the Archaic than in the Late Prehistoric periods, e.g., Schmitt chert mine (L. Davis 1977), and Palmer Quarry (Herbort 1981c). To make preforms for the SSNA points, smaller chunks of poorer quality knapping material could be used because the ideal flakes are thin and relatively small compared to a preform for any of the Archaic point types, e.g., McKean, Duncan, and Pelican Lake. In general, the larger the item to be made, the more carefully the material has to be selected and the core prepared.

The change which the expanding flake point tradition brought was an alteration in the method of manufacture of projectile tips to one that was more efficient in regard to both time and material. Thin, expanding flakes were removed from multi-directional, multi-faceted cores. The core itself required minimal preparation prior to removal of the expanding flakes. These thin, flat, generally ovoid flakes, after removal from the core, were then modified by pressure flaking into thinner triangular point forms which could then be notched and hafted for use as arrow tips. They are recognized as the small side-notched arrow points

found throughout the Plains and other areas of North America. Whether a similar manufacturing technique was used in other regions of North America when the bow and arrow became popular remains to be proven through detailed analysis of manufacturing debitage.

### The Core

The following hypothesized core morphology is based on amorphous multi-directional cores found at Benson's Butte. Such cores are common to the Pine Breaks area and the Northwestern Plains in general. To produce small expanding flakes a poorer quality lithic material and relatively small pieces can be used. The ideal flake for the SSNA point is ovoid, and flat, lacking a dorsal ridge. The only requirement of the core is that the striking edge must be between  $55^{\circ}$  and  $75^{\circ}$  and the edge be at least *minimally* prepared. Herbort (personal communication 1981) notes that on a core with the proper edge angle and a relatively smooth adjacent face the flakes could be produced rather consistently. Similar flakes would also be produced, either intentionally or as the result of reduction activities on a biface. The angle of the edge would be smaller, closer to  $55^{\circ}$ , on the biface-core. The face which would become the dorsal surface of the flake needs to be smooth with low ridges. The ideal flake cannot have a prominent dorsal ridge. It is difficult for the knapper to remove such ridges to produce the small thin flake preform. Figure 5 illustrates the ideal core and method of removal of the flake. The ability of the manufacturer to produce a relatively flat flake is a key to the success of this process. The direction and force of the blow are critical. In experimental replicative work using



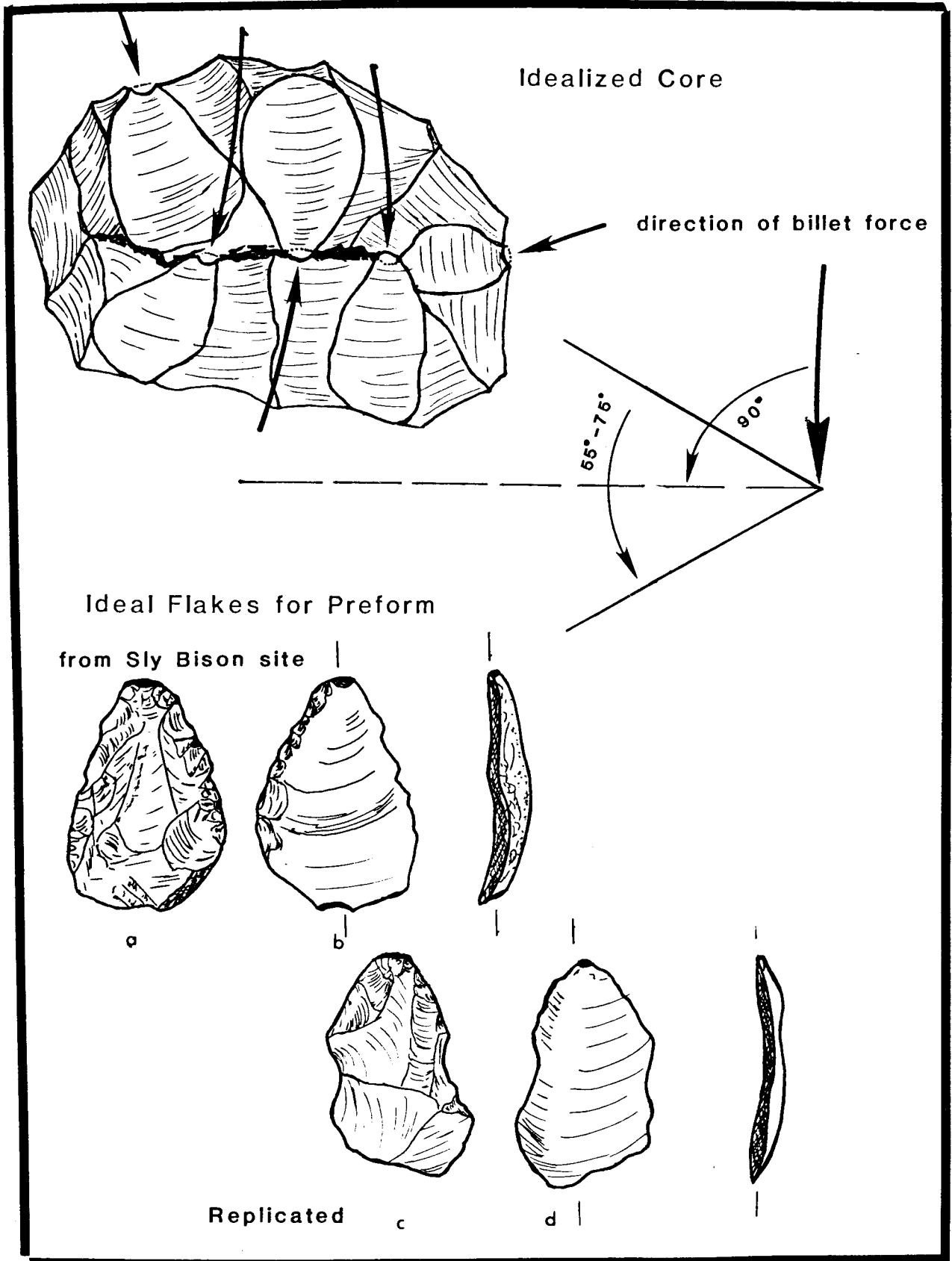


Figure 5. Idealized core and expanding flakes necessary for SSNA manufacture.

obsidian, an antler billet is most effective in removing the ideal flake. The relatively small size of the flakes suggests that one or two flakes could be removed even from relatively poor quality material, which could then be discarded. The billet strikes the 55-75° slightly ground edge of the core on the very edge or with a shallow "bite" (Patten 1978). As with any lithic production technique not every flake produced will be useable; of the many produced the best will be chosen.

In the Pine Breaks area this type of activity tends to be supported from the types of sites and materials observed and collected. Porcellanite, produced from the superheating of shales surrounding burned coal beds (D. Fredlund 1976), occurs throughout the area. There are few places where the porcellanite is of superb quality, but the prevalence of the material, and the associated prehistoric lithic waste indicate testing was a consistent, probably daily, activity. It also indicates that pieces of acceptable quality material could be collected almost anywhere. Small expanding flakes could be struck from the chunks of porcellanite collected on almost any ridge in the Pine Breaks area. In areas where marginal material is readily available, as in the Pine Breaks, the expanding flake point tradition would have adapted extremely well. It would also be particularly useful in areas where cryptocrystalline materials are in river or glacial cobbles. A bipolar technique for splitting the cobble would provide a ready surface for the removal of expanding flakes by the above billet technique.

The ideal flake has several specific characteristics:

- 1) it is thin (2-5 mm in cross-section),

- 2) it expands rapidly from the striking platform to reach its maximum width near the distal end,
- 3) there is little or no dorsal spine or ridge,
- 4) the distal end is generally feathered exhibiting no abrupt hinge fracture,
- 5) the bulb of percussion is relatively small, and
- 6) there is minimal curve from distal to dorsal ends.

The resultant flake is generally ovoid in plane view and flat in cross-section (Figures 6a & 7a).

#### Stages of the Triangular Preform

Once a flake is detached the next stage of manufacture is the alteration of the oval or tear-shaped flake into a triangular form through pressure flaking. The tip of the projectile point is generally at the proximal or platform end of the flake where thickness and strength is the greatest. Frison (1970a:18) observed this phenomenon on SSNA points recovered from Level IV at the Kobold site. Since the tip of the point is at the proximal end it is self-evident that the distal end of the flake will become the base of the arrow point. Modification of the flake edges began generally at the tip of the striking platform and then progressed down the flake's edges to the distal end (Figure 6b). This was done bifacially on each specimen. After each episode of modification of the edges, the chipped edges were dulled by grinding and/or crushing. This created an almost continuous platform for the next episode of flaking which further refined the flake into an ideal triangular shape (Figure 6g-i). During the first episodes of edge modification, pressure flake scar

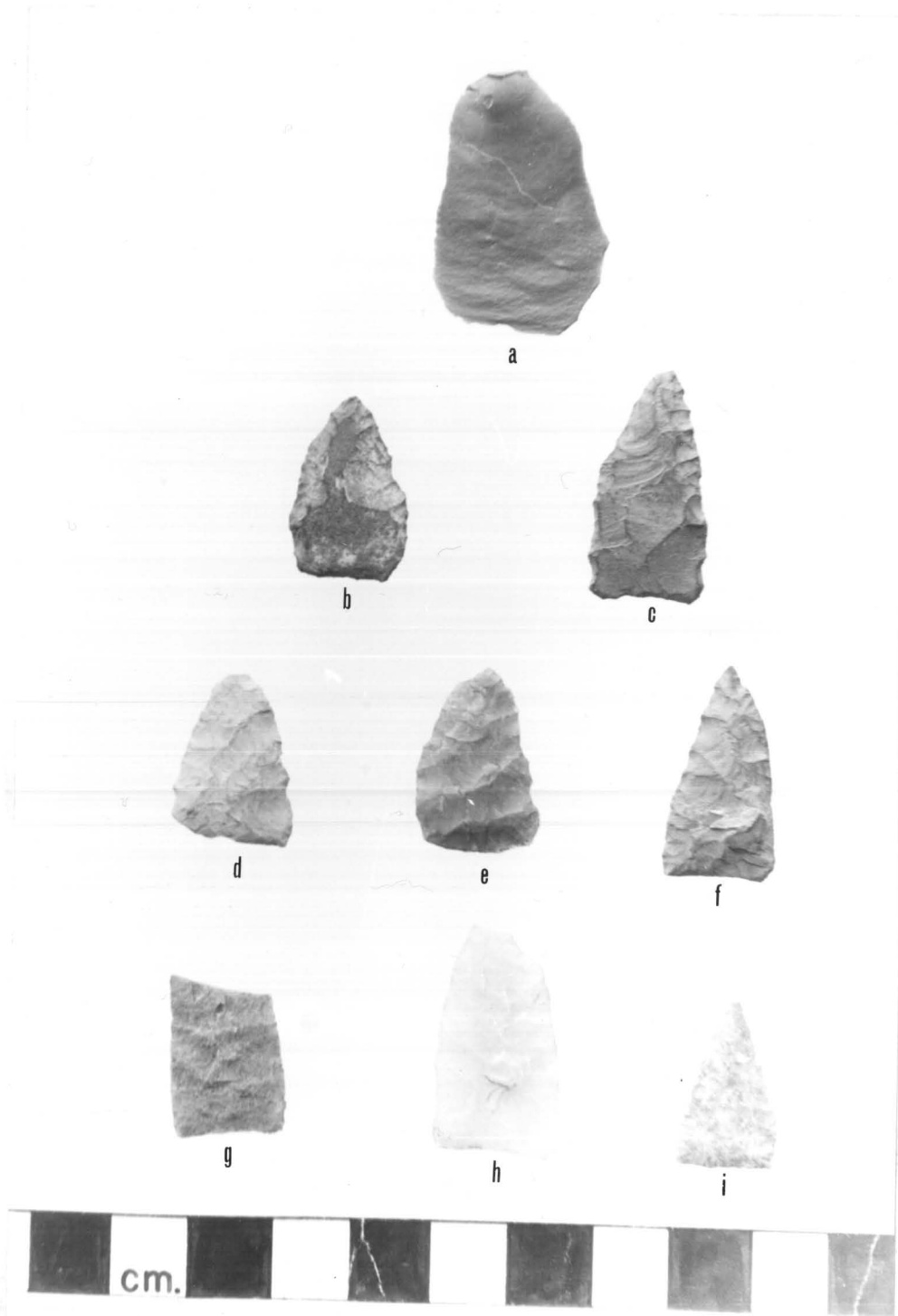


Figure 6. Artifacts from Benson's Butte showing progression of stages of preform manufacture. (From L. Fredlund 1979: Figure 19)



a



b



c



d



e



f



g



h



i

Figure 7. Illustrated artifacts from Benson's Butte showing progression from ideal flake to notched point.  
(From L. Fredlund 1979: Figure 18) Artifacts are actual size.

surfaces tend to extend only a short distance onto the parent flake's dorsal and ventral surfaces (Figure 7b-c). Each successive episode of flake removal produces an increasingly more elongate flake scar across the surfaces of the flake and, in turn, reduces the width of the preform and the flakes natural curvature. Consequently, as each flaking episode is completed the resultant flake scars intersect at or near the mid-region of the preform, and the overall flake blank becomes more lenticular. As the desired triangular shape is attained little or no evidence of the parent flake's original surface remains.

In some cases, however, an acceptable triangular form was achieved during the early episodes of edge modification. When this occurred much of the original flake surface remains visible or unmodified. Although such specimens appear crude when compared to those exhibiting flake scars over the entire blade surface, they are as functional. It thus appears that the quality of flaking visible on the blade surfaces of these SSNA points is directly related to the number of flaking episodes required to achieve the desired triangular shape. It follows that quality of workmanship on an SSNA point does not necessarily reflect the knapping ability of the craftsman.

As the length of the pressure detached flakes increases (Figures 6d, e and 7d-f), there was a greater chance for these flakes to terminate abruptly in a step fracture. When step fracturing occurred on the base end of the preform, these successive fractures could and occasionally did form a knob or protuberance of residual material (Figure 6h). If this occurred equidistant from the base and the blade edges, this knob could be difficult to remove, and as each episode of edge flaking was conducted, the height of the

knob would increase, often to a size or height where it could then be satisfactorily removed. If sufficient height was not obtained by flake removal, the knob was left on the blade surface. In the sample of pre-forms examined from Benson's Butte, 17% retained these material knobs, whereas only 7% of the finished side-notched specimens exhibited this phenomenon. This suggests some success in removing them.

In examining the projectile point sample from the Old Homestead Kill site, Munson (1980:) describes an additional step in the manufacturing process. A lack of symmetry on the dorsal and ventral faces must be remedied since the ideal is to have the tip and the base on the same plane.

Most of the points have major elongate flake scars on one face extending from the base edge forward towards the tip of the point. The other face has only minor elongate flake scars. This lack of flake symmetry on the base appears intentional. The major flakes are produced to compensate for the lack of symmetry on the face of the point. In other words, upon drawing a line through the point from tip to base, that face which is thicker, measured from the internal line outwards will have the major basal elongate flaking. The result is that the tip and base edge are on the same plane. Some of the very unpatterned points have retouched flake scars solely on one basal face (Munson 1980:47).

Figure 8 describes this basal thinning process.

Frison (personal communication 1981) suggests that removal of flakes at the proximal end of the flake was conducted in an attempt to flatten the flake curvature. As with the basal thinning the proximal thinning was to keep the tip and base on the same plane or compensate for the flake's curvature.

Modification of the base of the point began in the early episodes of edge chipping, culminating in the removal of elongate thinning flakes extending from the base edge forward toward the tip of the point (Figure 7b, f).

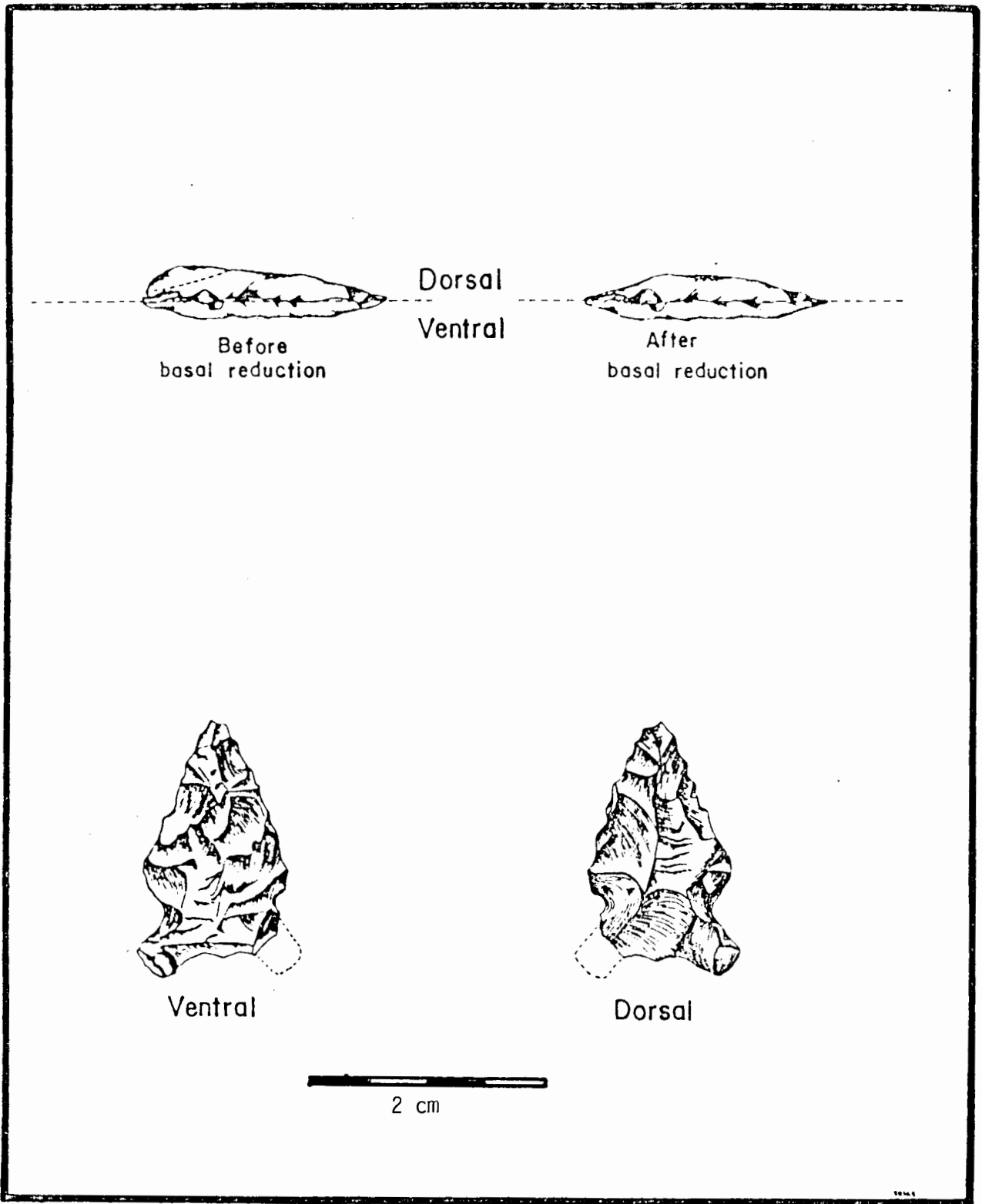


Figure 8. Illustrated example of basal thinning to produce base edge and tip on same plane (from Munson 1980: Figure 12)



## Finishing and Hafting the Point

Notching and basal grinding appear to be the final steps in the manufacturing process, probably because they are most effectively done at the time of hafting. However, grinding can easily be accomplished as part of platform/edge preparation on the base. Because shaft width varies, the size and depth of the notches must be adjusted to match the shaft. This would involve one of two notching methods: roughly measuring the size of the shaft, judging the notch size and notching it, or inseting the point in the shaft and then notching it to fit. Notching was accomplished by the removal of flakes by the "push" method (Herbort: personal communication 1981). Apparently, the "pull" was too strong an action to use on the thin preforms, since SSNA points do not exhibit the rounded, deep flake scar on the notches from "pull" flake removal. At this time the base could be ground or crushed to dull it for adaptation to the wooden shaft. If these hypothesized steps are correct, then preforms would be expected to exhibit little basal dulling. In the case of the Benson's Butte sample, the unnotched points or preforms (Table 7) exhibited no basal grinding, while 16% of the notched specimens had ground bases. These data are based on a sample of 100 of the most complete notched and 100 of the most complete unnotched forms.

If breakage occurred during the later stages of manufacture, the most usable fragment was frequently reshaped. On the tip fragments a new base would be formed and thinned to produce a shorter and narrower point. On base fragments blade edges were reconstructed to form a new tip. Such specimens tend to have pronounced convex blades and to be squat in appearance with a disproportionately wide base. Similar modification

and reuse of projectile points has been noted at other sites, e.g., the Ruby site, a single component Late Plains Archaic bison trap. Here Frison (1971a:82) notes that 23% of the points had been modified from basal or distal point fragments. Lewis (1947:57-59) observed this same reuse of point fragments on arrow points collected from bison kill sites in northern Montana.

Table 7. Morphological Analysis of Base Attributes of 100 Triangular Forms and 100 Side-Notched Arrow Points from Benson's Butte. (Modified from L. Fredlund 1979:Table 8)

Base Attributes	Triangular n=100	Side-Notched n=100
Incurvate	52	54
Incurvate ground	0	48
Straight	46	46
Straight ground	0	13
Excurvate	2	0
Excurvate ground	0	0
Thinned	100	100
Straight	11	27
Excurvate	89	73

#### Comparison with Notched Points

With the exception of notches and some evidence of basal grinding, the finished triangular form or preform exhibits features identical to the small side notched arrow point (Table 7): tip orientation is toward

the proximal end of the flake; blade edges vary from straight to excurvate, generally being slightly excurvate; base thinning scars are usually visible extending upward from the base toward the tip with base shape being either straight or concave. In the Benson's Butte sample, none of the preforms or notched specimens exhibit break fractures from any cause other than "bending stress" (Ahler 1970) or "transverse end shock" (Crabtree 1972). This probably occurred during the fabrication process. No impact fractures were noted. Thus, except for notching and basal grinding, the triangular forms are indistinguishable from the small side-notched points whether Avonlea, Prairie or Plains side-notched.

#### Changes Through Time

In applying the Expanding Flake Point Tradition concept to the varieties of SSNA points, several observations and speculations can be made. In examining the Avonlea type, the points are characteristically well-made with flake scars crossing the blades. They are thin in cross-section and the notches are shallow. A manufacturing problem for Avonlea point users is that the thinness of a flake (and subsequent preform and point) is directly related to easier breakage. The shallow notches, made by the push technique, were perhaps a compensating factor to maintain thinness but lessen the breakage rate by notching.

In contrast with Avonlea, the Prairie point type is characteristically thicker, not as finely made and has deeper notches. As the point/preform/ flake is made thicker, notches can be made deeper with less chance of breakage. The major change to the Plains type from the Prairie is

that a wider, higher base is created by placing notches higher on the point toward the tip. This may be a form of strengthening the point tip since slightly less of it would be exposed when it was hafted.

### Summary of SSNA Manufacture

This SSNA manufacturing process is described in the following steps.

1. Selection and preparation of a core.
2. Preparation of a platform(s) and the production of a thin (2-5 mm thick) expanding flake by direct percussion with a billet.
3. Alteration of the expanding oval or triangular-shaped flake into a triangular form through pressure flaking usually initiated near the tip (striking platform) of the flake.
4. Dulling by edge grinding of the lateral edges after each episode of flaking in preparation for the next pressure flaking run. This dulling/flaking sequence continues until the desired triangular blade shape is attained. (Often an acceptable triangular shape was achieved with little modification of the edges, leaving the dorsal and/or ventral blade surfaces unscarred.)
5. Forming of the point base. This was coincident with the general shaping of the triangular form, and culminated in the removal of the elongated thinning flakes extending from the base toward the tip.
6. Completion of the haft elements by basal grinding or crushing, and notching.

Based on an understanding of the manufacturing process of SSNA points

it is suggested that most artifacts referred to in the literature as triangular unnotched "points" (i.e., Plains Triangular, Avonlea Triangular, Catan) are, in most cases, preforms for SSNA points.

If the expanding flake point tradition is associated with the beginning of Avonlea, then roots of this tradition should be found with the roots of Avonlea. Areas where Avonlea is speculated to have arisen are varied. Briefly these are: from Besant (Byrne 1973), from the midwestern Laurel tradition (Morgan 1979; Syms 1977), or from Pelican Lake (Reeves 1970). Geographically, these origins would be expected to be in the interior of British Columbia, the aspen parkland on the fringes of the Canadian prairie, or in the woodlands of Minnesota or Manitoba. As suggested by Morgan (1979), it is possible that as these peoples moved onto the Plains to hunt bison, they were forced to break into smaller groups and develop a more dispersed settlement pattern. If this were the case, each small group would have to become more self-reliant. As a result of being dispersed and having to become more self-reliant, each group member might be required to produce a supply of points without relying upon the skills of a specialized craftsman who formerly practiced his craft within a stable settlement pattern. The supportive evidence for the origins of the SSNA tradition in such a dispersed settlement system should be found in the lithic debitage: billet-produced flakes from a platform of 55-75°, cores which reveal this activity and the flakes themselves. The Pine Breaks and other areas of the Northwestern Plains will provide greater supportive information on the Tradition as a whole. However, the periphery of the Northwestern Plains should yield evidence of the initial use of SSNA points and the development of the expanding flake point tradition.

## Chapter 6.

### ECOLOGICAL DIVERSITY WITHIN THE NORTHWESTERN PLAINS

The significance of the geographic area, defined here as the Pine Breaks of southeastern Montana, is in its potential for the study of subsistence systems by prehistoric populations. Adaptive strategies for subsistence in the Pine Breaks were, of necessity, different from strategies in common use on the open Plains. Hunting patterns, gathering patterns, and camping locations, for example, were different. This chapter is included to provide a basis for comparison of the Pine Breaks with the open Great Plains to the north, south and east. The attributes thought and known to be important to prehistoric adaptive strategies are discussed. The next chapter provides a hypothetical view of Late Prehistoric human adaptation and a look at how Pine Breaks human groups might have interacted with adjacent Northwestern Plains populations.

The Great Plains stretch approximately from the Mississippi River and the northwest trending Laurentian uplift to the Rocky Mountains in the west. The Northwestern Plains, as defined previously, can be considered to be bordered by the aspen parklands of Alberta and Saskatchewan on the north, the mixed prairie grasses on the east, the Rocky Mountains on the west, and the North Platte River Basin in Wyoming on the south. In terms of geography, the Northwestern Plains includes the southern half of Alberta and Saskatchewan, the western one-third of North and South Dakota, and the eastern two-third of Wyoming and Montana (Figure 1, p. 3). The vegetation is generally classified as short-grass prairie. This is a region which is usually defined by similarities in climate, vegetation and faunal species. It is a culture sub-area in a Kroeberian sense, in that the primary animal species

preyed upon by prehistoric people for the last 10,000 years was Bison sp.

Typical Great Plains surface relief varies from flat to rolling prairie, dissected by creek and river valleys which sometimes cause locally dramatic terrain. It is generally treeless except along streams. Two primary drainage systems are important to the Northwestern Plains: the Missouri, and the Saskatchewan. Other major rivers which drain into one of the above are the Milk, Yellowstone, North Platte, Red Deer, and Qu'Appelle. These and other large streams are generally bordered by gently rolling slope lands which often become steep and heavily eroded. These "breaks" or badlands can create obstacles to cross-country movement. The river valleys are often deeply cut. Elevation changes between the grassy table lands and the river bottoms range up to 1000 ft (300 m).

The Northwestern Plains were glaciated to an area roughly paralleling the Missouri River in Montana. Occasionally the flat plains topography is broken by "outlier" mountain ranges (e.g. Snowy Mountains, Little Rockies, Bearpaws, Cypress Hills). The climate for the region is characterized by moderately low rainfall, hot summers, and cold winters with frequent sunny days. Seasonal and diurnal temperature extremes are common, and faunal and floral species must be able to adapt to these extremes. Wind is a constant problem on the Plains; it affects humans psychologically as well as physically (Cordell 1971:11). The psychological impact of the wind is a common thread in novels of early plains/ prairie settlers, e.g. Giants in the Earth by Rolvagg. For Glasgow, Montana, the mean wind speed is 11.1 mph (17.9 km/hr) mostly from the west-northwest.

Near the mountains and foothills, especially along the east slopes of the Rockies, chinook winds, often up to 80 km/hr or more, serve to break the

cold winter weather. These warm winds caused by low pressure systems to the west, can raise temperatures in just hours from  $-18^{\circ}\text{C}$  to  $10-15^{\circ}\text{C}$ . These winds impact mostly on the mountain/foothills and rarely extend more than 150 km from a mountain area. Figure 9 shows the approximate areas in which chinook winds are felt.

Although considered as part of the Northwestern Plains, the topography and associated ecological changes throughout Montana and Wyoming create substantially different environments. Mountain ranges in Montana and northern Wyoming form a large triangle from the Rocky Mountains to the Black Hills. Wyoming's mountain ranges are separated by large arid basins, while Montana's mountains occur in small isolated uplifts often referred to as outliers. Figure 9 shows the topography of the Northwestern Plains in general, and Figures 10 and 11 describe the changes in topography from east to west and north to south. It is apparent from these figures that the lands of Montana and Wyoming, although plains-like with many of the same characteristics in the flatlands, are broken by numerous mountain ranges. The importance of these mountains to the prehistoric populations is in the very diverse ecological situations they create. This is a beneficial phenomena for several reasons: 1) the diversity provides habitat for a greater variety of faunal and floral species and 2) such diversity provides ecological niches that provide greater subsistence potential during marginal climatic and seasonal conditions. The following discussion of the topography of the Northwestern Plains illustrates this diversity. The cumulative effects on the prehistoric populations is just being recognized. At the Canadian border (Montana-Alberta), latitude  $49^{\circ}\text{N}$ , the high mountains (2750 m amsl) of Glacier National Park/Waterton Lakes National Park fall sharply



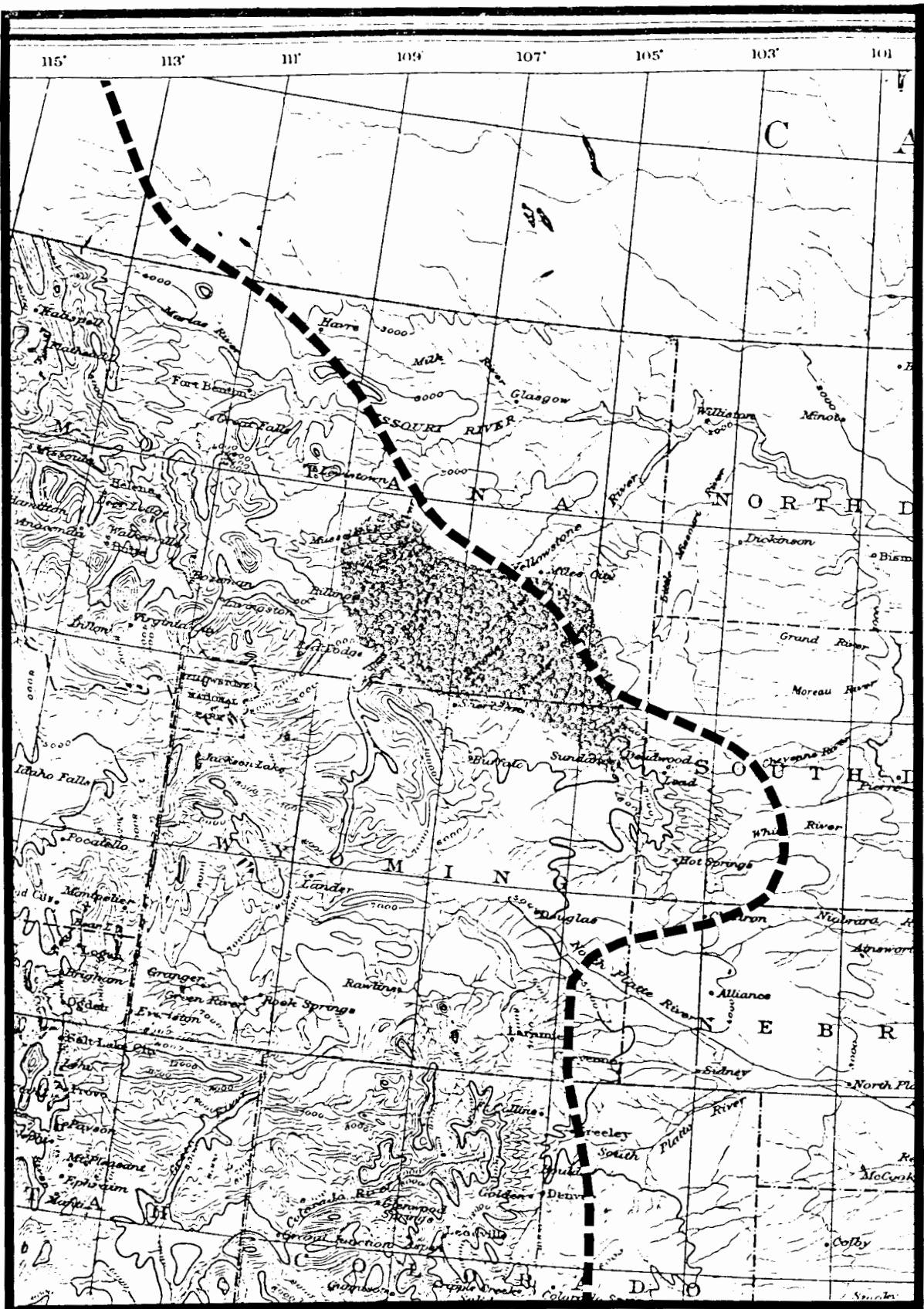


Figure 9. Topographic map of Northwestern Plains showing the eastern influence of Chinook winds and the Pine Breaks area (shaded). (Compiled from USGS polyconic projection 1964 and S. Heck, meteorologist: personal communication 1980)

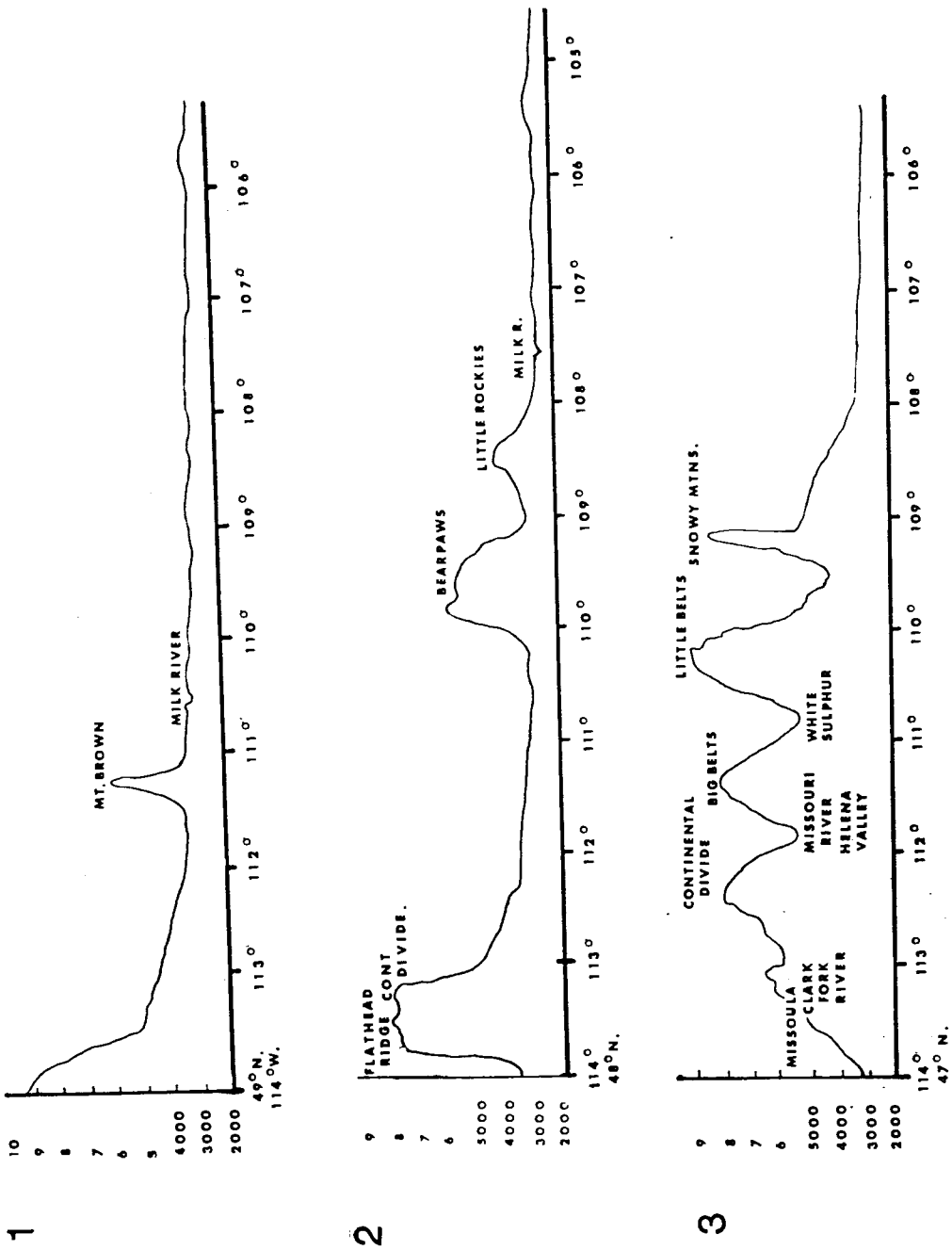


Figure 10. Topographic cross-sections of the Northwestern Plains showing the areas of relief: 1-Canada/U.S. border 49° N, 114° W; 2-Kalispell to Wolf Point, MT 48° N, 114° W; 3-Missoula west 47° N, 114° W. (Compiled from USGS State of Montana 1966)

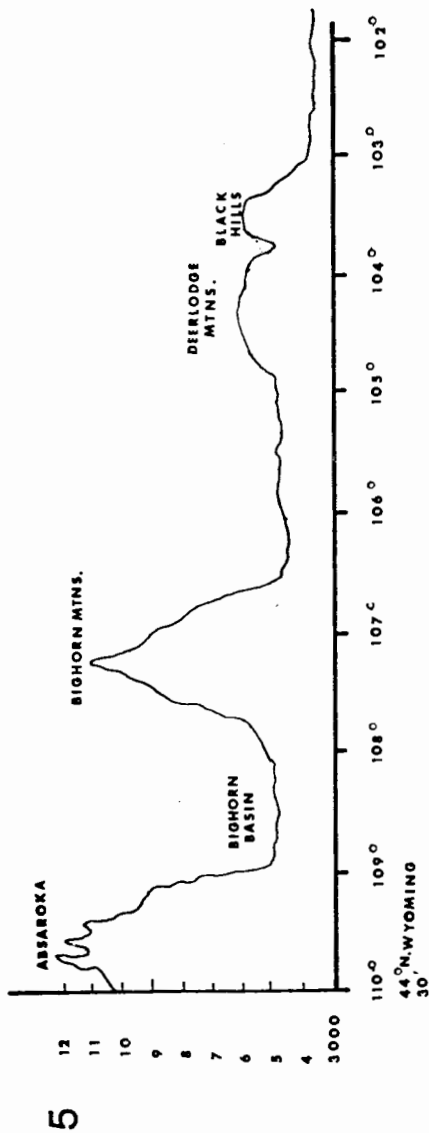
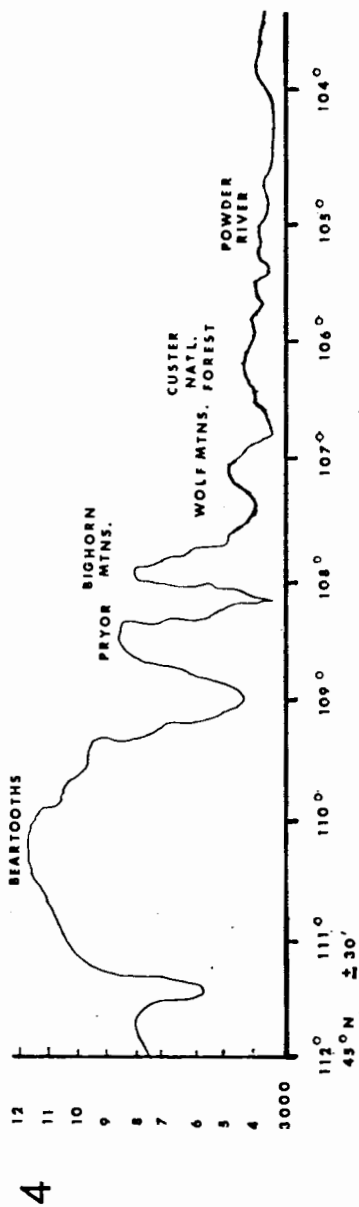


Figure 11. Topographic cross-sections of the central portion of the Northwestern Plains: 4-Wyoming/Montana border 45° + 0' - 30' N, 104° - 112° W; 5-west of Rapid City, SD 44° 30' N, 102° - 110° W. Cross-section 4 is not a straight east-west line but varies within 1° to include the Pine Breaks area. (Compiled from USGS State of Montana 1966 and Wyoming Aeronautics Commission 1975-1976.)

to the plains (900 m amsl) (Figure 10-1). From the base of the mountains to the east there is little change in the topography or the environment, just a gradual decrease in elevation. For central Montana a very different situation exists. From Missoula (approximately 47°N latitude), located in the intermountain region west of the Continental Divide, to 108° W longitude there are a series of small mountain ranges and valleys with true plains country between them. From the Continental Divide east the topography drops to the Missouri River and Helena valleys, and then goes up in elevation to cross the Big Belts, the Little Belts and then the Snowy Mountains just south of Lewistown (Figure 10-2, 3). From there east the land levels off into a comparatively flat plain broken only by occasional areas of pine ridges and badlands. Some of the pine ridge country and badlands cover large tracts of land such as the Bull Mountains north of Billings and the badlands of western North Dakota.

In northern Wyoming, latitude 44° 30', the Rocky Mountains drop sharply into the Bighorn Basin. The basin is then bordered on the east by the high Bighorn Mountains, and from there drops off to the plains (Figure 11-5). Farther south, at the Colorado-Wyoming border, the Rocky Mountains again form an imposing mountain wall as they rise to 3650-4000 m amsl, or 1800-2400 m above the valley floor.

### The Pine Breaks

The topographic cross-section (Figure 11-4) was taken at an angle from the high country of the Beartooth Plateau through the Pine Breaks to the Black Hills of South Dakota. Cross-sections of the Northwestern Plains topography

(Figures 10 and 11) and the above discussion were included here to illustrate the significance of the Pine Breaks area to the region as a whole. The Pine Breaks are a continuation of a physiographic system of mountain-valley-foothills which, in effect, bridges a gap between the high mountain regions of the west and the plains to the east. Although lower in elevation the area offers advantages similar to the mountains without their difficulties, e.g., rugged terrain, seasonal access problems, high winds and deep snow. The general vegetation, fauna, soils and climate are all similar to the open plains. However, the Pine Breaks area offers many things that the Plains do not: shelter from the wind; an available wood supply for fuel; sandstone for dwelling construction and ready-made shelter; abundant lithic material for stone tool manufacture; a relatively abundant water supply; and a diversity of ecological situations which provide greater variety of faunal and floral species within relatively easy access. These factors are of considerable significance to the adaptive strategies of prehistoric populations.

Frison states:

The character of the Northwestern Plains changes markedly to the east of the Bighorn Mountains along the drainages of the Little Bighorn, Tongue, Powder, and Little Missouri rivers in southern Montana and northern Wyoming. Here there is more moisture and grass is higher and thicker. The area is marked by buttes, escarpments, and shallow but rough canyons covered with sagebrush, ponderosa pine, and juniper. Mesas are a common feature and the entire area in general supports excellent stands of grass. In southern Montana are several important geomorphic features including the Wolf and Rosebud Mountains.

The Yellowstone River and its wide valley comprise a special part of the Northwestern Plains. The stream valley has several broad terraces, and tributaries provide rough country; bluffs and escarpments are seen on both sides of the valley. The Yellowstone River and its major tributaries provide a natural entrance from the east into the heart of the Northwestern Plains as does the North Platte River further to the south. The drainages of the

Yellowstone River east of the Bighorn Mountains include some of the best grass country - and consequently in the past some of the best buffalo country - known for the entire plains. Elevations are lower and winter climates are less harsh than some of the higher intermontane basins. (1978:6-7)

The Pine Breaks lie primarily within the Northern Powder River Basin, a broad synclinal downwarp covering approximately 300 km north/south and 125 km east/west in southeastern Montana. Most of the topographic relief is formed by the massive Fort Union Formation, a sedimentary Paleocene deposit. The formation's strata consist of alternating layers of coal, sandstone and shales. Of these the Tongue River Member of the Fort Union Formation contains most of the coal beds of current economic importance. Overlying it is the Eocene age Wasatch Formation, similar to the Fort Union Formation in make-up. The Wasatch Formation is visible in the higher elevations of the mountains (Wolf, Rosebud and Little Wolfs) which form the northwestern border of the Powder River Basin in this area. Below the Fort Union Formation is the Hell Creek Formation of upper Cretaceous age. This is visible occasionally on the northwestern and eastern fringes of the Powder River Basin in Montana. Along the major river valleys, the Yellowstone, the Powder and the Tongue, are terraces capped by Tertiary and Pleistocene glacial outwash gravels. These gravels contain chert, chalcedony and quartzites, all important lithic materials to the prehistoric inhabitants.

The Pine Breaks area is drained by northward flowing streams which empty into the Yellowstone River. The primary drainages are the Tongue and Powder Rivers which have their headwaters in the Bighorn Mountains. Along the way north these rivers are nourished by numerous small streams flowing from springs and seeps originating in the higher elevations of

the Wolf, Rosebud, Little Wolf Mountains, and within certain areas of the Custer National Forest. Consequently, water, although sometimes containing salts making it cathartic and foul-tasting, is relatively accessible throughout the Pine Breaks area. Many of the smaller streams are seasonal and intermittent, flowing most profusely in the spring and often drying up or going under ground in the late summer months. The availability of water is related to the coal beds which act as aquifers throughout the Powder River Basin.

Topographically the land surface is "a rolling upland dissected by steep-walled valleys" (USGS 1970:II-1) (Figure 12). These valleys are



Figure 12. Aerial view of Pine Breaks area near Decker, Montana. Benson's Butte is at center bottom of photo.

often 700-1300 m below the ridges. Erosion resistant, clinker-capped sandstone ridges, mesas and plateaus are dissected by small streams and wide (2-3 km) grassy valleys (Figure 13). Badlands develop occasionally in clay sediments. Porcellanite, a metamorphosed shale of coalburn origin, is found on the sandstone ridges, rimming areas which burned and subsequently eroded in the geologic past (D. Fredlund 1976). Coal burns, some of which are still burning, consume the coal and super-heat the shales, which metamorphose into varying grades of material some of which is known as porcellanite. The burning of the coal seams has had a significant impact on the topography in that the clinker or burned shales and porcellanites form an erosion resistant caprock over underlying sandstones, thus creating sharply varying rates of erosion between burn and non-burn areas. The result is the rough "breaks" topography. The importance of porcellanite to the prehistoric populations in the area was that it was a readily obtainable and abundant material from which stone tools could be made.

### Climate

As part of the Northern Great Plains the climate of the area is continental. The weather in the winter is controlled by Arctic air masses which move down the east slopes of the Northern Rocky Mountains. Precipitation comes from Pacific air masses. "Most precipitation falls during the late spring and early summer when warm, moist air drawn northward from the Gulf of Mexico rises across the high plains and is progressively cooled" (USGS 1979:II-20). Mean annual precipitation varies with



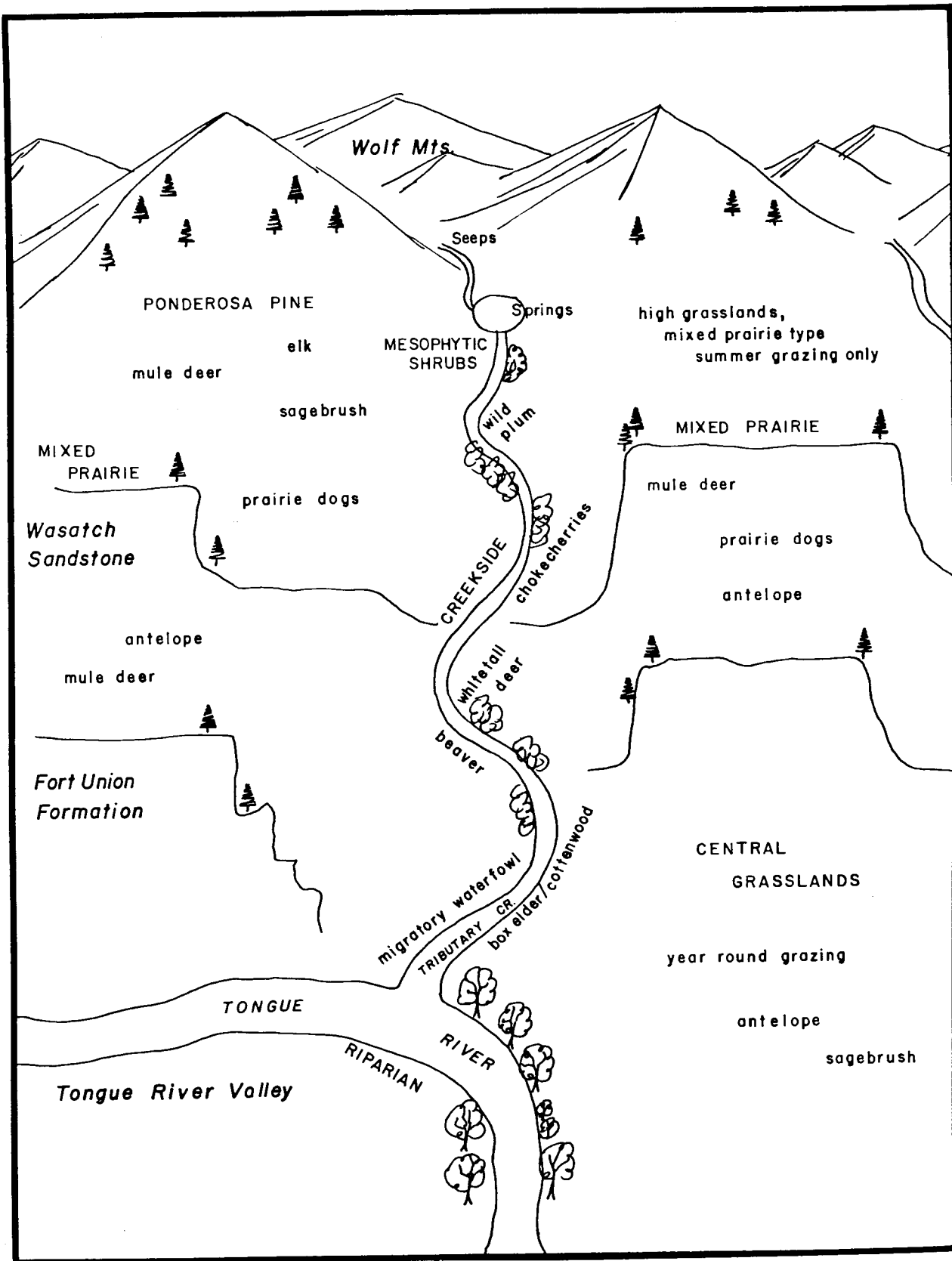


Figure 13. Idealized environmental overview of Wolf-Mountain Tongue River area in the Pine Breaks. (From L. Fredlund 1979: Figure 3)

elevation and proximity to the Bighorn Mountains. Mean annual precipitation at Decker, Montana, is 30.5 cm (12 inches) and at Colstrip, 160 km north, 38.1 (15 inches). Total annual snowfall ranges from 76-130 cm (30-50 inches)(USGS 1979: II-21-22). Figure 14 describes a 21 year cycle of precipitation based on data from four stations from 1920 to 1976.

The wind, or relative lack of wind, could have influenced prehistoric settlement patterns. In the Pine Breaks area near Colstrip, surface winds recorded for three years (1974-1977) averaged 11.3 km/hr (7.0 mph) and were generally out of the west-northwest. For a true Plains environment such as Glasgow, Montana, wind speeds averaged 17.8 km/hr (11.1 mph). Surface winds in the Colstrip area reflect slightly different orientations based on the local topography which "approximates the axis of the drainage" (USGS 1979: II-31). These data indicate that in the Pine Breaks winds are more moderate than on the open plains.

## Soils

Generally speaking the soils in the area are poorly developed. Most of their characteristics are derived from the geologic parent material:

Soils formed on the Fort Union Formation, which range from claystone to sandstone, are clayey to sandy. Fine loamy textures predominate, with major exceptions, such as some of the areas in and around Colstrip where unusually sandy textures are common. (USGS 1979:II-59)

The archaeological record suggests that areas with sandy soils were often chosen as site locations because they provide an easily manipulated surface for cooking pits and a well-drained camping situation. By contrast, on the open plains the sod is often difficult to penetrate, even with a

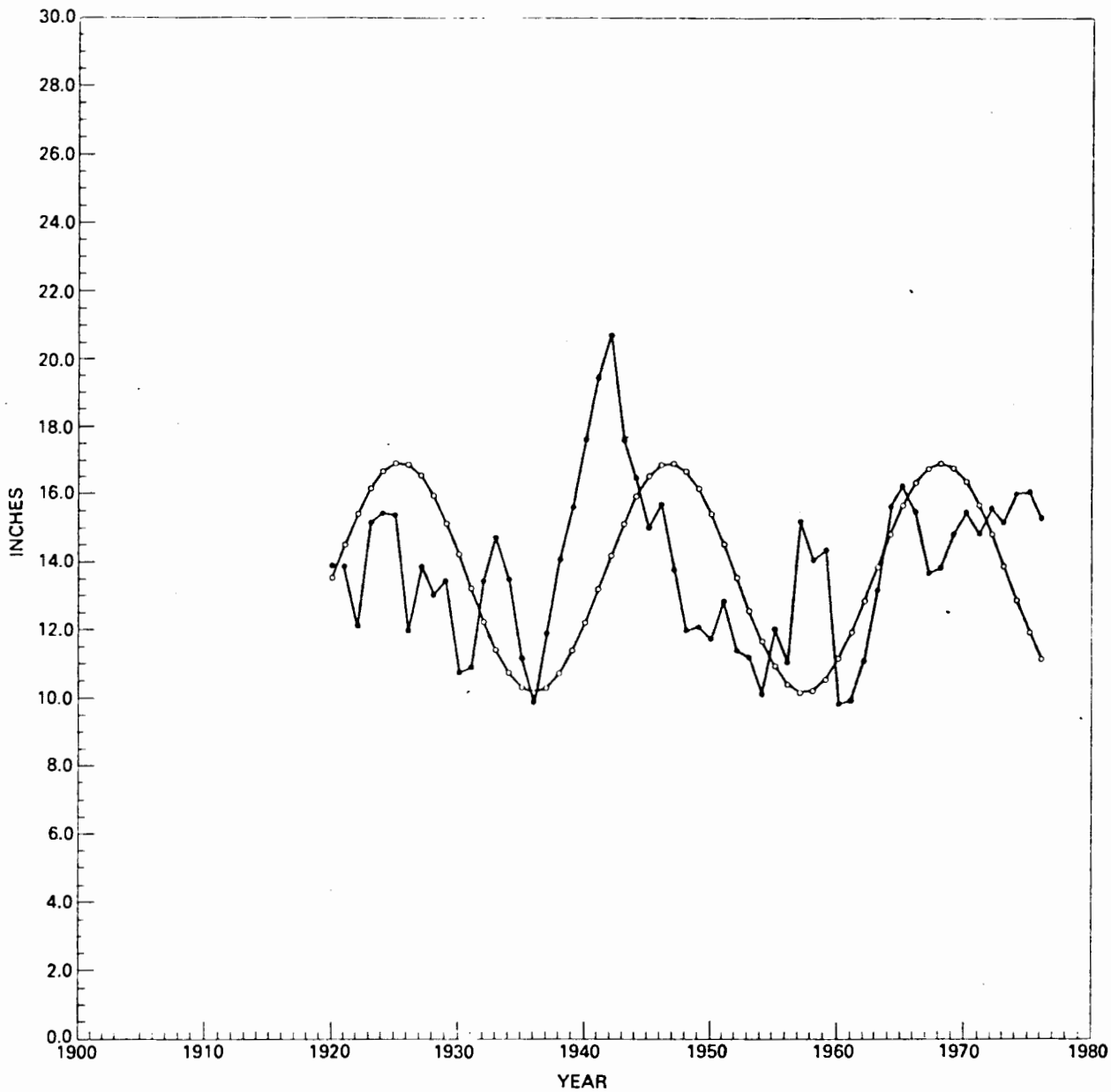


Figure 14. Precipitation fluctuation in the Pine Breaks area. The open dotted line represents an assumed 21 year precipitation cycle while the other line represents the actual data from four stations in the area. (From USGS 1979: Figure II-12.)

steel shovel. Clearly the sandy surfaces in the Pine Breaks would have definite advantages.

### Wildlife and Vegetation Characteristics

Directly related to the climate is the carrying capacity of the land. This is determined by the type and amount of vegetation available. The use and abuse of the land in southeastern Montana by Euro-American civilization in the last century has drastically altered the face of the land in general, and the wildlife and vegetative characteristics specifically. Overgrazing, chisel plowing, extensive rodent control, and some generally dubious agricultural practices in this semi-arid region have lowered the water table, and changed the character of the plants and wildlife. The occurrence of animals such as bison, beaver and wolves in the area can be documented from historic sources, e.g., Lewis and Clark and other early explorers and naturalists. The reconstruction of the vegetation communities, however, is much more difficult. Consequently, detailed studies and correlations of current vegetative communities to prehistoric sites is of dubious value to archeological inquiries.

While it is essential, for descriptive purposes, to recognize and identify plant communities that collectively constitute the current regional environment, there is, for the archeologist, limited value in dealing with each plant community independently. On the grasslands particularly, the settlement of the west produced major changes: domestic species of grass were introduced, the native sod was cultivated, timber in the creek valleys and uplands was cut, domestic animals with different grazing habits and food

preferences were introduced. These factors combined with overgrazing produced an environment which was conducive to the increase of invader plant species like cheat grass. As a result, plant community margins and ratio characteristics of today's regional environment are very different from those that existed during prehistoric times. For these reasons the vegetative environment is here looked at in more non-specific terms of topographic/ecological or geographic zones. While plant communities within each zone are recognized, they are felt to be of secondary importance to general geographic zones as described below.

The Pine Breaks area can be divided into four geographic zones: drainage bottoms, terrace/slopelands, sandstone ridges/rimrocks, and uplands/foothills. Table 8 lists the zones and their dominant vegetative components or communities. The biotic characteristics of the four zones are described briefly.

Terrace/Slopelands. Generally terrace/slopelands consist of gently rolling grasslands sloping to the creeks and rivers. These grasslands are often dissected by eroded gullies and small areas of badlands topography. There are a multitude of grassland communities which today include cultivated lands. The dominant species vary considerably due to slope, soils, degree of erosion, and grazing activity. Prickly pear cactus (Opuntia polyacantha) and yucca (Yucca glauca) are common succulents. Western wheatgrass (Agropyron smithii), blue grama (Bouteloua gracilis), bluebunch wheatgrass (spicatum), needle-and-thread grass (Stipa comata) and many other grass species are common and mixed in varying proportions. In more moist areas mixed prairie species are more common, e.g., big bluestem (Andropogon gerardi), sideoats grama (curtipendula). Badlands are

Table 8. Geographic Zones and Their Respective Vegetative Components as Described for the Pine Breaks Area and, Specifically, the Project Area.

<u>GEOGRAPHIC ZONE</u>	<u>VEGETATIVE COMPONENTS</u>
Drainage Bottoms	Riparian:  deciduous plant species sedge-grass-rush
Terrace/Slopelands	Grasslands:  grass-sage-prairie flora shrub grassland badlands flora
Sandstone Ridges/Rimrocks	Pine Ridge:  pine-juniper grass-sage prairie flora
Uplands/Foothills	Ponderosa Pine Parkland  pine forests grassland parks:  prairie grasslands sagebrush prairie tall grass prairie

characterized by poorly developed soils, heavy, shaley clays and badlands topography. Vegetation in these areas consists of big sagebrush (Artemisia tridentata), saltbush (Atriplex sp.) and greasewood (Sarcobatus vermiculatus). Silver sage (A. cana) is common in drainage bottoms. Sage is an important food and shelter resource for antelope (Antilocapra americana), mule deer (Odocoileus hemionus) and gallinaceous birds. On badlands with available water, winterfat (Eurotia lanata) might be present. This plant is an important food source for many large ungulates.

In the past antelope, mule and white-tailed deer (O. virginianus), elk (Cervus canadensis), and bison (Bison sp.) would be expected. The primary ungulates of the grasslands today are cattle. Prairie dogs (Cynomys sp.) and rabbits (Sylvilagus sp., Lepus sp.), often part of the prehistoric subsistence base, would also be found in the grasslands.

Sandstone Ridges/Rimrocks. The sandstone ridges/rimrocks zone generally borders or divides the grasslands. This zone contains the erosion-resistant sandstones, scoria and porcellanites. On the sandstone ridges scrub ponderosa pine and juniper are the dominant species and botanically characterize the zone. Mule deer, porcupine (Erethizon dorsatum), badger (Taxidea taxus), skunk (Mephitis mephitis), and rabbits are commonly found within this zone as well as in the open grasslands. Porcellanite, the lithic material used most commonly by prehistoric populations in the area, outcrops frequently in this zone. Vegetation, often occurring in rocky soils, consists of ponderosa pine (Pinus ponderosa), and Rocky Mountain juniper (Juniperus scopulorum). Understory species vary widely and include grasses similar to those found in the grasslands. A common shrub is skunkbush sumac (Rhus trilobata). In the drainages within this zone western chokecherry (Prunus virginiana), currants (Ribes sp.) and wild rose (Rosa sp.) occasionally can be found.

The importance of the sandstone ridge zone is that it provides the sharp relief characteristic of the area. For human populations this means observation potential, sandstone shelters (rock shelters and overhangs), access to porcellanite, and terrain which, though sometimes difficult to traverse, is favorable for stalking game.

Drainage Bottoms. This zone is comparatively flat in topographic relief with relatively rich alluvial soils. Willow (Salix sp.), box elder

(Acer negundo), and cottonwood (Populus deltoides) predominate.

Riparian areas are especially important because they are a crucial source of biological diversity. Riparian areas are (generally) scarce in the region and make up a relatively small portion of the land resources. (USGS 1979:II-68)

Under the cottonwoods and box elder are found understory species such as willow, wild rose, chokecherry, currant, wild plum, and other brush species, many of which yield edible fruits. The distinction between riparian grasses and grasses of the terrace/slopelands is, in general, that the former grow lusher and taller. Wildrye (Elymus cinereus and canadensis) grows in drainage bottoms as does wild onion (Allium sp.). The primary source of water for all species living in the area, the riparian zone, although small in acreage, is extremely important now, as it was in the past. All ungulates must move to the zone at least once a day. Many small birds and mammals live in the dense vegetation along the streams and rivers. In the past, beavers provided a particular service by creating ponds along streams, thus providing habitat for a variety of water fowl, water plants such as cattails, and many other water-adapted species. Prior to the historic fur trade and the subsequent over-trapping of beaver, this animal's activity expanded the riparian zone in the Pine Breaks area, and throughout the Northwestern Plains. In dry years the damming of water would be extremely important, maintaining more permanent water sources in the area.

Uplands/Foothills. This zone is characterized by stands of a subspecies of ponderosa pine which has adapted to the marginal conditions of the arid plains environment. This pine is characterized by having two needles rather than the customary three of the yellow or ponderosa pine found in the more mountainous regions to the west. The other tree common to this zone is Rocky Mountain juniper. Understory species include



skunkbush sumac, creeping juniper (J. horizontalis) and western snowberry (Symphoricarpos occidentalis). In some cases the pine cover is thick and can be considered a true forest. Portions of the area contain forests which have been harvested commercially. Several sawmills operate in the area. When the pine is not dense, the land can be classified as open parkland or savannah, with large areas of grass occurring among the stands of pine. These savannah areas are important to the wildlife species in that they provide an "edge effect" (USGS 1979:II-65). Presumably this edge effect would also have been important to prehistoric populations. Pine savannahs provide shade for cattle today, and, in combination with the sandstone rimrocks and ridges, provide the characteristic "Pine Breaks" scenery of the area.

The pine grows on hills and north slopes and is generally associated with sandstone ridges and outcrops. Porcellanite commonly outcrops within this zone as well as the sandstone/rimrocks zone. Wildlife common today include a variety of small mammals, grouse, birds, and the mule deer. Mule deer (Odocoileus hemionus) are particularly adapted to the broken topography and the parkland environment of this zone. Their ability to stot (leap up on all four feet) up hill to escape enemies, utilize existing browse, and bed in the semi-open parkland makes this an ideal habitat for them (National Geographic Society 1979:368). Water, in the form of seeps and springs from exposed coal seams, is common. Because of the grassland/forest mix, fauna common to grassland and ridges are also found within this zone.

## Prehistoric Use of Faunal and Floral Resources

Plants used for food, medicine, tools, or other purposes are found in all the resource zones described above. Ponderosa pine nuts were potentially important as a food source. Juniper berries could be gathered. Wild carrot, wild turnip, sego lily, cattails, wildrye, and a large variety of other plants have been recognized as useful for food or medicinal purposes to ethnohistoric Amerindian groups (e.g. Mulloy 1958, Hart 1976, Grinnell 1972, Kaye and Barry 1978). Which of the many were utilized and the nature and extent of use in the past can only be suggested. Also, as has been pointed out by many (e.g. Colson 1979) what was a delicacy for one group was not collected by others. Kaye and Barry (1978) discuss the use, distribution and nutritional value of the wild turnip (Psoralea sp.), which has not been recorded in archaeological context in the Northwestern Plains. The following floral materials have been recorded in archaeological context from Daugherty and Spring Creek Caves (Frison 1965, 1967), Mummy Cave (McCracken 1978), and Pictograph Cave (Mulloy 1958):

Skunkbrush sumac (Rhus trilobata)

Mountain mahogany (Cercocarpus ledifolius)

Chokecherry (Prunus virginiana)

Willow bark (Salix sp.)

Milkweed (Asclepias sp.)

Yucca (Yucca glauca)

Clematis (Clematis sp.)

Cactus (Opuntia polyacantha)

Oregon grape (Berberis aquifolium)

Wild onion (Allium textile)

Faunal remains found in archaeological sites dating within the last 5000 years are commonly those of large ungulates, many of which are not found in the area today. Small mammals such as rabbit, hare and prairie dog are also reported in archaeological context. The larger ungulates, however, provided the main substance of the economic base for the prehistoric populations. Bison were certainly common in the Pine Breaks and, because of the broken nature of the terrain, could be found in smaller herds. This characteristic, forced on the animals by the topography, would provide excellent hunting potential. Deer, particularly mule deer, were well-adapted to the parkland/savannah terrain of the Pine Breaks. The availability of the willows and chokecherry brush in the draws and along the creeks would have provided year-round browse for elk and deer. The large amount of terrain covered by sagebrush, particularly silver sage, would have and still provides a primary food source for antelope. The effect of beaver on the riparian ecosystem would have established ponds for migratory birds, thus establishing a potentially important seasonal food resource. In general, there were a great many species of birds, animals and plants available. Because of the ecological diversity of the Pine Breaks area many of these would have been more readily accessible than in the open Plains.

In sum, the Pine Breaks environment offered the prehistoric populations a number of advantages over that of the open plains. The grasslands offered the same abundance of game found on the plains, and many other things that could not be found so easily in the wide open lands. Readily available water, abundant and accessible lithic materials (both porcellanite outcrops and river gravels), shelter from the wind, and great ecological

diversity which concentrates in a relatively small area a large variety of exploitable floral and faunal resources are all present in the Pine Breaks. Clearly these factors would create a more comfortable and secure living situation than could be found on the open prairies.

#### Climatic Change During the Late Prehistoric Period

In any area moisture is the major limiting factor in determining the carrying capacity of the land, and therefore is a major factor in shaping adaptive strategies of human populations. The Pine Breaks area, because of its ecological diversity and constant water supply, would have been a more pleasant area to be in during drought conditions than the open plains. Although vegetation and animal units available for exploitation would be considerably reduced, the many seeps and springs would provide perennial water. Based on Coupland (1958), Reher et al (1977:35-43) suggests these changes in available moisture occur in three orders of magnitude: the first being a drought (or decrease in precipitation) for 5-10 years, the second a drought of 100 years, and the third order a drought for 1000 years. The first order of magnitude is similar to the droughts of the 1930's which ended the dreams of many homesteaders on the Northern Plains. Presumably this order of change would have little long-term impact on a prehistoric population. Drought of the second order of magnitude would tend to decrease the grassland potential, decrease the biomass and significantly decrease the prehistoric populations and encourage greater mobility for survival. Drought of the third order of magnitude is not relevant to the Late Prehistoric period on the Northwestern Plains. It is suggested (Reher et al 1977) to have been the condition during the Altithermal (Figure 15).

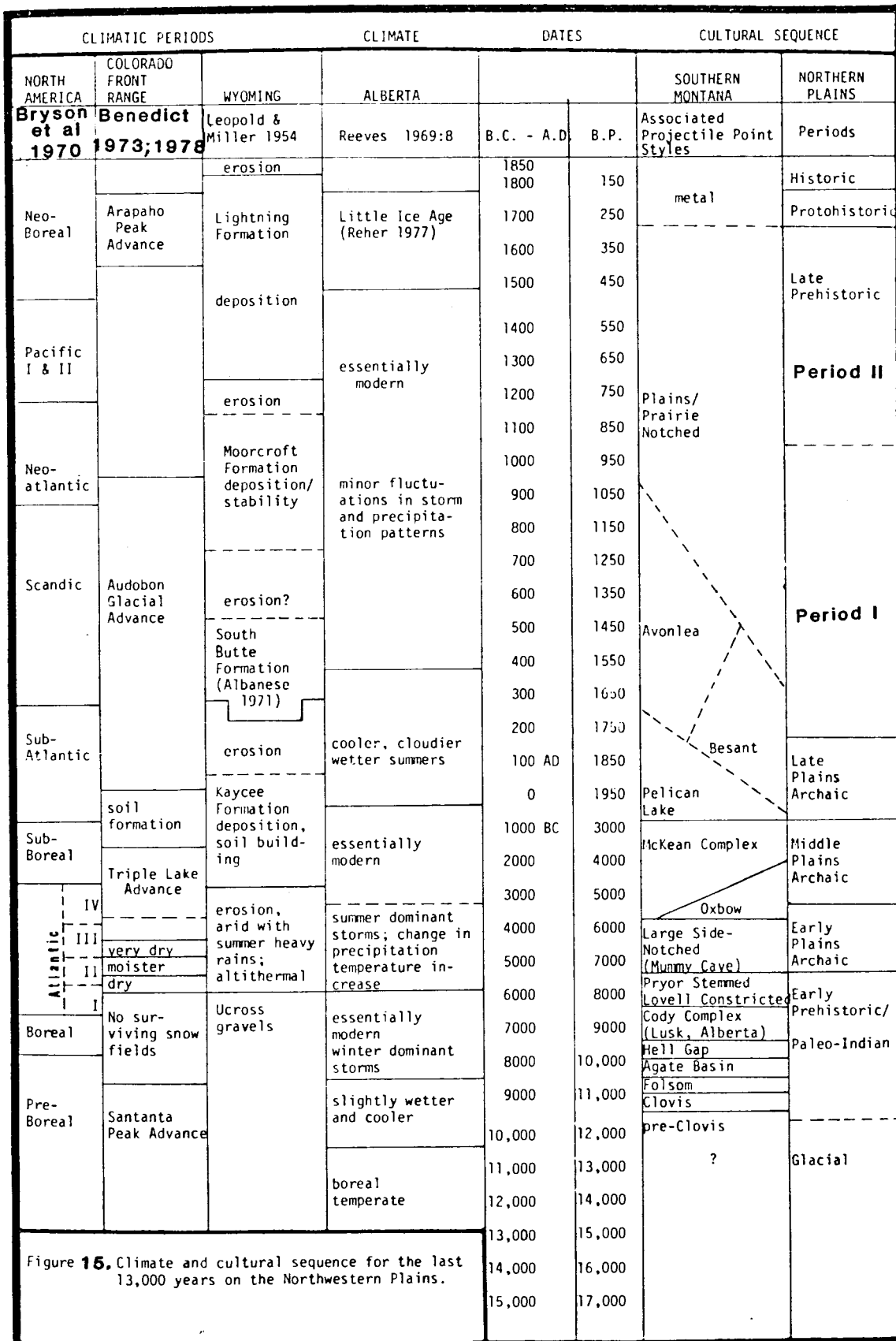


Figure 15. Climate and cultural sequence for the last 13,000 years on the Northwestern Plains.

No paleoclimatic studies have been conducted in the Pine Breaks area but climatic changes for the last one thousand years are known from Alberta, Colorado, Wyoming and other areas of North America. Figure 15 describes the climatic and cultural changes for the last 10,000 years in the area. Albanese (1971, 1978) examined locations associated with archaeological sites, and added and refined Leopold and Miller's original sequence. Benedict (1973), using data from glacial sequences in Colorado, discusses Holocene climate in the central Rocky Mountains. Tentatively, this data can be assumed to correlate with changes that occurred in the Bighorn Mountains and the more northern Rocky Mountains of Montana. Reeves' (1973) interpretation of Alberta climatic chronology gives a perspective from the Northern Plains. Mehringer et al (1977) and Swanson (1972) discuss Holocene stratigraphy from locations near the Montana-Idaho borders. For North America in general, Wendland (1978); Bryson, Baeris and Wendland (1970), and Baeris and Bryson (1965) note a number of relatively stable climatic episodes from the last 10,000 years. For purposes of this discussion the last 1000 years which encompasses the Late Prehistoric period, will be discussed. The discussion will focus on how these changes might have effected the Pine Breaks area and the coping strategies of the human inhabitants.

On the plains an essentially modern climate was established by around 2000 B.C. and continued through the Late Prehistoric period with only minor fluctuations. Albanese has been able to isolate two erosional episodes in the last 1000 years in the Powder River Basin. These events are identified by extensive arroyo formation occurring at A.D. 200-400, and A.D. 1400. These dates correlate with the end of the Sub-Atlantic period and the beginning of the Lightning Formation, and with the Pacific period

(Figure 15). The Sub-Atlantic, according to Baeris and Bryson (1965), was from 600-500 B.C.- A.D. 300-400. It was characterized by a more severe climate, which correlates with Reeves (1969), who suggests that it was a time of cooler, wetter summers. If this was the case, it would have been a time of increased grazing potential on the plains, and therefore increased ungulate populations. This correlates with archaeological data from southern Montana and Alberta which reflects a significant increase in the density of sites from this period. Results of inventory work in southeastern Montana indicate that 13% of all temporally identified sites are from the Middle Archaic period (3000-1000 B.C.). In the next 1200 years the percentage increases to 42% for the Late Archaic (Table 2, p. 52). This relatively favorable climate and ecological situation provided the basis for the human populations of the early Late Prehistoric.

The end of the sub-Atlantic and the change in the Scandic episode (Baeris and Bryson 1965) correlates with Albanese's (1978) suggestion that there was increased arroyo formation to A.D. 200-400. Based on studies in Scandinavia Baeris and Bryson (1965) suggest that there was a warming trend. On the other hand, after a review of pollen data from the northern Midwestern United States (e.g., Iowa, Wisconsin, and Minnesota) Vickery (1970) suggests that there was a cooler or deteriorating climate in that area. For the Northern Plains, the human population apparently was not as great as during the Late Archaic. It is characterized by the Avonlea phase on the Canadian prairies and in northern Montana. From the Yellowstone River south there is the Benson's Butte-Beehive complex and sites, most often rock shelters, with corner-notched points,

e.g., Colt 45, Horse Shelter (D. Fredlund 1973), Spring Creek Cave (Frison 1965), Sorenson VI (Husted 1969). Communal bison procurement dating to this period is common on the Northern Plains, e.g., Wardell (Frison 1973), Garrett (Morgan 1978), and Wahkpa Chu'gn (Brumley 1971) and is known from the Pine Breaks from the Sly Bison site (Steere 1980) and possibly O'Dell Creek (Waldman 1979). While Reeves (1969) treats the period from A.D. 300 to the present as essentially modern with minor fluctuations in the overall climatic patterns, Albanese (1978) notes an erosional sequence around A.D. 1400, and Bryson et al (1970) document a specific climatic episode for the 12th century A.D.

At A.D. 1100 Bryson et al (1970:64-70) suggest that, as in Europe, there was an increase in westerly winds. The further assumption is that, if these strong westerlies similarly effected North America, the Plains climate would have been altered because the dry air would be driven farther east. Based on cultural and climatic indicators collected from deposits at the Mill Creek site in Iowa, it appeared that, in fact, this was the case, and that the change of climate occurred very rapidly, probably in less than 100 years. This was evidenced by a dramatic change in food resources used by the Mill Creek populations. It is possible that this same westerly trend also increased the aridity in the western plains, and created the erosional sequence noted by Albanese. Reher notes a similar phenomenon in southeastern Wyoming:

A change to much drier conditions by the 1300's apparently caused Upper Republican peoples to fall back, far to the east. Archaeologically there is almost a cultural hiatus during the 1400's, although a small resident population of Athapaskans and Shoshoneans from behind the mountains, is possible. This episode sets the scene for the coming expansions of the Little Ice Age (1977:138-139).



For Wyoming, Montana and the Canadian prairies there is a general lack of sites radiocarbon dated to this period (A.D. 1300-1450). Whether this is a reflection of a temporary climatic change or a result of the archaeological sample is not known.

The most recent and well-documented climatic period is a colder, moister period known as the Neo-Boreal or Little Ice Age. It correlates with the Arapaho Peak advance in the Colorado Front Range (Benedict 1973) and is followed by a period of erosion and gully cutting beginning about 1900, and continuing into the present (Albanese 1971; Leopold and Miller 1954). Biologically the Little Ice Age was important primarily because the climate caused the plains grasslands to attain their peak carrying capacity. The bison herds reached a maximum in numbers. The human populations, who had or were in the process of acquiring horses and were being forced onto the Plains by European expansion, developed the historic Plains horse-bison culture. Thus, the cooler, moister climate of the Little Ice Age increased the grassland capacity for carrying the large ungulate herds, and coincidentally aided the tribal groups in their migration onto the plains.

In summary, there have been several shifts in climate of a second order of magnitude during the last 1000 years: a cool moist period till A.D. 300-400, a relatively modern climate till A.D. 1200-1300, a drier period from A.D. 1300-1500, and the Little Ice Age from A.D. 1500-1900. The effect on the human populations in the Pine Breaks during these periods of change was considerable. In examining human adaptations in the Pine Breaks area these periods of change are considered.

## Chapter 7.

### ADAPTIVE STRATEGIES OF THE LATE PREHISTORIC PERIOD IN THE PINE BREAKS OF SOUTHEASTERN MONTANA

After re-evaluating the cultural chronology for the Late Prehistoric period on the Northwestern Plains, it is fitting to use this revised system to explain prehistoric settlement/subsistence patterns and adaptive strategies in the Pine Breaks area. The data base is in the early Refinement Stage II; just beginning to be large enough and complete enough for preliminary analyses. Statistical techniques of comparison were not used because of the state of the available information and the lack of consistency in the inventory coverage and reporting. Although considerably more inventory work has been conducted than is directly dealt with here, the following were selected based on my familiarity with the work, the generally complete site descriptions, and the projects' span of a wide of range ecological areas. For instance, Big Horn-Jensik Hill (Hogan and Anderson 1979) covers lands adjacent to the Tongue River, Youngs Creek Mine is in the middle elevations of the Wolf Mountains (L. Fredlund 1981), Montco (Waldman 1979) encompasses the lower elevations of the Custer Forest and the broad terrace of the Tongue River, and the other four projects cover smaller drainages and the ridglands in between. Seven inventories were selected and the following information was gleaned from tables with corroborative information from the narratives (L. Fredlund 1977a:Table 38; 1981:Table IIE-3; Gregg 1977a:Table 25; Hogan and Anderson 1979 (no table, compiled from narratives); Mineral Research Center 1980: Table F-2; Munson and Munson 1980: Table 11; Waldman

1979: Table 26). The total number of sites compiled from these reports is 181; 58 can be assigned to the Late Prehistoric period. Figure 16 shows the location of these inventories.

Human activities are discussed in terms of the ecological setting described in the previous chapter. The focus is on settlement, hunting and gathering, food preparation and lithic procurement. Relationships of the Pine Breaks human groups to human populations in other areas will be discussed.

### Settlement Patterns

Throughout the Pine Breaks area of southeastern Montana, prehistoric occupation is most often found either within the pine and sandstone ridge country or on grassland terraces back from the creeks. Within the ridgeland and pine savannah country are relatively extensive base camp sites, smaller locations of specific activities (generally unknown as to function), lithic procurement and testing locales, and a small percentage of other types of sites (petroglyphs, bison kills, rock structures). The distribution of these sites provides information on adaptive strategies for hunting and gathering, lithic procurement, and campsite location.

Of particular importance to campsite and hunting associated sites are two basic ecological principles: edge effect and ecotone location. Odum (1971:157) discussed this principal:

The ecotonal community commonly contains many of the organisms of each of the overlapping communities and, in addition, organisms which are characteristic of and often restricted to the ecotone. Often, both the number of species and the population density of

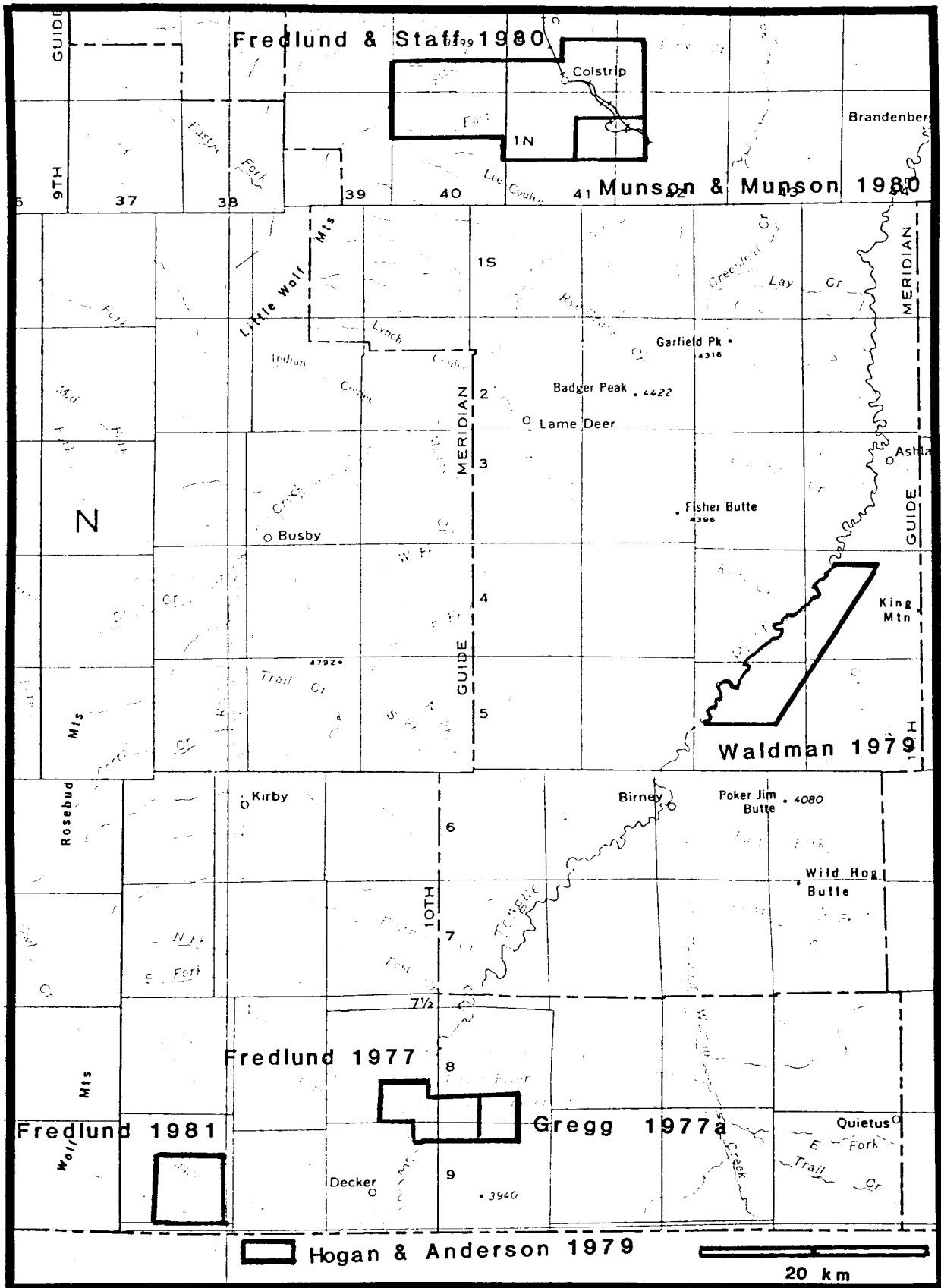


Figure 16. Map showing the approximate location and area of the projects discussed. (Base map is USGS State of Montana 1966)

some of the species are greater in the ecotone than in the communities flanking it.

The principle of the ecotone provides several advantages to all species. In such a situation there is the potential for a larger number of species to exist in a small area. The varied topographic and geographic system of the Pine Breaks provides a kind of general ecotonal situation: between the mountains and plains, between the forests and the grasslands, and between the grasslands and riparian zones. On a more local level there is the edge effect of forest to grassland, and grassland to broken sandstone topography. For ungulates this generally means a wider variety of forage species. For humans it means a wider variety of animal and plant species to gather or prey upon. The edge effect is particularly important and obvious in the pine ridge-savannah areas where there are pine forests adjacent to many open grassland parks. The sandstone rim-rocks, buttes and erosional remnants offer even greater diversity by providing niches for coyotes, owls, and various other fauna. Human hunters are also well adapted to such a situation since it provides a means of movement through areas with limited chance of being seen. Herbivores grazing in the grassland parks would be less likely to spot a human in the forest edge. The concept of the ecotone would also be beneficial for the gathering of vegetable foods since it would provide a maximum number of plant species within a limited areal extent. It is also important in locating campsites since the edge effect provides visual protection from animal groups or other humans. In considering the location of the 181 sites, 90 are considered to be at locations where the principle of the edge effect would be beneficial and a possible reason for selection of the location. If a site is in the pine-badlands,

pine-savannah, or adjacent to a riparian environment, it is considered to be in an ecotonal situation.

Most occupation sites are located in the pine breaks or grassland ridge areas as opposed to open grasslands or creeksides. Table 9 is a compilation of information on the 58 Late Prehistoric sites in the 181 site sample. It provides environmental zone association and other selected data relative to specific site type. Settlement systems of the Late Prehistoric are compared to the Late Archaic to see what changes, if any, can be detected. Of the 26 Late Archaic sites six occupation sites (23%) are within 100 m of a water source. This compares with 8 of 45 Late Prehistoric sites (excluding bison kills and petroglyphs) or 18%. Information from a recent inventory of approximately 25,000 hectares where a majority of sites are Late and Middle Archaic indicates that there is a strong association of these sites to the creeks (G. Munson, personal communication 1981). Excavation and collection on another project near Colstrip, Montana, has been conducted (Munson and Munson 1980; S. Munson 1981). From the radiocarbon dates there appears to be an increased use of small rockshelters beginning around A.D. 50 and up through historic times, but no indication of such habitation previous to A.D. 50. At our present level of information we cannot fully document, but can only suggest a settlement pattern change between the Late Archaic and the Late Prehistoric.

Campsite locations in the Pine Breaks were chosen by consideration of the availability of certain resources and, when possible, a number of creature comfort considerations. For the Pitjandjara of Australia, Tindale (1972:244-245) reports the following site selection factors in order of importance for the hot desert land: water, firewood, view,

Table 9. Selected Late Prehistoric Sites by Type, Classified According to Geographic Zone and Other Factors

Site Type	Pine Savannah	Sandstone/Grassland/Ridge	Rolling Grassland	Riparian	(Sub-total)	100 m or Less to Water	Fortification Potential	Observation Potential
Hunting or Temporary Camp	6	7	3	1	17	2	7	13
with stone circles	1	1	1	-	3	1	-	2
Base Camp	8	1	2	-	11	3	6	8
with stone circles	1	3	-	-	4	1	1	2
Kill and/or Drivelines	1	2	2	-	5	2	-	2
Petroglyphs	3	5	-	-	8	2	-	2
Rockshelters	4	1	-	-	5	1	1	2
Other	2	2	1	-	5	-	2	4
Totals	26	22	9	1	58	12	17	35

ground texture, insect and plant pests, good air flow, presence of game, and adequate supplies of vegetable foods. It is expected that similar criteria were in use in southeastern Montana.

The availability of wood, probably for fuel and for dwelling construction, was a consideration. Evidence of the use of wood in dwellings is from Protohistoric structures which were built of wood, or rock and wood, and presumably covered with hides. Examples of sites with these structures are 30 Mile Mesa (Mulloy 1965), LD Wooden Structure (L. Fredlund 1977), Timber Town (Loendorf 1969) and Emil's Lodge (Conner 1974). These are interpreted, based on ethnohistoric and ethnographic information, as war lodges or quick shelters while hunting or making war. The use of wood for the framework of habitation structures is assumed to have been the norm prehistorically, based on ethnohistoric data from the Plains, as described above, and other areas of the world. The Pine Breaks area provides a general availability of ponderosa pine and juniper on the ridges and willow, cottonwoods and box elder in the main creek drainages. From studies of wood used in firehearths the primary wood reported is ponderosa pine (Dr. Edwin Burke, Department of Forestry, University of Montana: personal communication 1981). However, willow was burned at Benson's Butte. Willow and pine would certainly have been used in dwelling construction. It would be expected that the structures set up one year would be left and could be used by another group years later if still standing. In the mountains of Colorado heavily weathered tipi poles were observed by the author leaning against a tree. A hearth was nearby. These were apparently left at that site and could have served more than one group.



Rock, particularly the ever-present sandstone, was also used for the construction and support of dwelling structures. Sandstone outcrops are most commonly found on the ridges and grassland terraces back from the creeks, but one is rarely more than 100 m from outcropping sandstone and scoria. Stone circle sites are not uncommon in the Pine Breaks and have been variously assigned to the Late Archaic, Late Prehistoric and Protohistoric periods. They are not often found in the large numbers as is common in the open Plains to the north. Sites exhibiting one to ten rings are most common, and cultural material is not always found associated surficially or subsurface. A type of dwelling structure reported which is unusual and known from Benson's Butte and the Beehive site in Wyoming (Zeimens, personal communication 1979) is a circular structure with rocks piled up to form a low wall. The interior was then slightly excavated into the subsoil (Figure 2, p. 49).

Rock shelters and sites within or adjacent to sandstone outcrops are common in the Pine Breaks. Often these are very small and would have sheltered no more than one or two people. Drifter's Shelter had a floor space of no more than 6 m<sup>2</sup> and indicated a single incident occupation (L. Fredlund 1975). For quick shelter for a short period of time these small overhangs were very useful. As indicated by Colt 45 (D. Fredlund 1973) , Timi's Shelter (Munson and Munson 1980) and Engineer Shelter (S. Munson 1981) these small shelters were often used over and over again. For south- or east-facing shelters the added temperature control, i.e., storage of solar heat in winter and ability to hold cool night time temperatures in summer, was certainly a significant factor. Tindale (1972:244) reports that the Pitjandjara chose to camp near granite boulders in Australia for this very reason. Benson's Butte was a good

example of a location where the solar effect would have been beneficial. With the southern exposure and sandstone backdrop the main part of the site would have benefited from the solar radiation in the evenings. With a lean-to to provide shelter from the winds this could be a very comfortable location. The number of sites possibly benefitting from radiant heat to some degree is 47 out of the 181. This, in most cases, would be a limited effect where sandstone or a rimrock wall outcrops on or near the site.

Shelter from the ever-present winds of the Northwestern Plains is thought to be a prime factor in selecting the Pine Breaks and smaller pine covered ridges throughout the Plains for occupation. Trees and ridges are the only available wind breaks in these areas. Although dwelling could be constructed to afford this protection, wood for the dwelling structures must be transported to woodless locations in the open plains. Thus, for wind protection and dwelling construction wood was a primary resource and was apparently a factor in site selection.

Proximity to water was not always of primary importance in site location during the Late Prehistoric period. Of the 181 sites only 31 (12 Late Prehistoric) were 100 m or closer to at least a seasonally dependable water supply. Rather sites tend to be above or over 100 m removed from an actual drainage as discussed above. Near Decker, Montana, a survey of 8320 acres (3368 hectares) yielded the following:

... sites representing temporary camping activity are located from 100 to 400 meters from seasonal water supplies, an average of 280 meters. The Tongue River provides the only known supply of permanent water for the area and the distance to this source is up to 5 km, for instance, from the Bad Water Site (24BH1521). From this data it is apparent that factors other than water were more critical for site selection.

Several reasons can be suggested for this apparent aversion to camping adjacent to water sources. First, camping near a water

source would tend to disrupt the daily cycle of use of the specific source by the animal populations. Humans would tend to frighten the animals off and force them to utilize another watering location. Secondly, sites adjacent to the creeks are often low in relief and the observation potential of these sites would be minimal. This would reduce the group's knowledge of human and animal movements within the area (Fredlund 1977a:147-148).

Haberman (1973) suggests that in Protohistoric times horses and their need for water and forage might have changed this pattern. Based on the Protohistoric Rabbit Ears site in the Youngs Creek area (L. Fredlund 1981) and several historically known Crow Indian camping locations in the Little Bighorn valley (Joe Medicine Crow and Frederick Lefthand: personal communication 1978), it appears that the pattern did not change as Haberman suggests. Rather these reported sites are on high rimrocks overlooking a broad valley with good grass and a permanent water supply.

Soils in the area range from clay to sand, with varying degrees of loaminess. Soils derived from the sandstone of the Fort Union Formation are, however, the primary soil type and, as such, tend toward sand mixtures. For the 181 sites examined 61 are on sand surfaces while 64 are on sandy loam, silty sands or other combination. The remaining sites are on bedrock, shale, or loam and four are on clay surfaces. The tendency is for camping locations to be on sand grading to sandy loam. Clay surfaces were rarely selected. All the Late Prehistoric occupations (excluding petroglyph and quarry sites) were on sandy or loam surfaces. Several reasons can be postulated. The first has to do with drainage. In the Northwestern Plains storms come up suddenly and can deposit great amounts of moisture (snow or rain) in a short period of time. The sandy soils would tend to drain better than those tending to clay. Secondly, sandy soils are much more malleable than clay soils. If the surface is to be modified by man in any manner this becomes an important factor. If

dwelling structures are to be made, sand can be piled, shifted, or excavated. If firepits are needed for specific food preparation, they can be dug. Sand can be manipulated most of the year except during sub-freezing temperatures which tend to occur between December and March. Even during these cold months, sandy soils, if not too water-saturated, can be modified, while clay when dry or frozen cannot. For the Pitjandjara, "warm sandy ground is first choice; rough rocks and clay are avoided if possible" (Tindale 1972:244).

Another factor in the location of sites is one which is difficult to measure or describe and is essentially dependent on the interpretation of the archaeologist recording the site. This is observation and/or fortification potential. Observation, depending on what one is observing, can be from a spot on any terrace, bench or knoll, as well as from a high rimrock. Obviously the scope of the view is related to this. For the Pine Breaks area high rimrocks with often spectacular views of the valleys below are the rule, but other, lower knolls are very available. The archaeologist can speculate on the observation and fortification potential, but so much of the choice is relative to the immediate need. Historically documented fortification sites involving Crow warriors are known and reported (Loendorf and Good 1977; Medicine Crow 1975). Many of the locations are not high buttes or other obvious easily fortified locations, but were chosen by necessity. Of the Late Prehistoric sites examined 17 were thought to be fortifiable while 35 provided opportunity for good observation of the surrounding terrain (Table 9).

The Pitjandjara feel the view from a site is third in importance behind water and wood:

... view sufficient to prevent close approach of strangers without visual warning for the last one or two hundred yards of approach. This factor operates very strictly in hilly or undulating country; it may be less important on open plains (Tindale 1972:244).

Besides watching for human activity, observation and monitoring movements of herd ungulates such as bison and antelope is important in order to maintain knowledge of faunal resources. For the Benson's Butte populations the effort expended to haul food, water and wood to the top of the butte was apparently worthwhile. There was basically only one easy way to the top and that is the main trail, easily defended by a few individuals. The Beehive site (Zeimens: personal communication 1980) is apparently a similar situation, as is Arrowhead Rock (Visborg 1972). Although most other Late Prehistoric sites are located at considerable elevations above the valley floor the fortification aspect is not as obvious as at these sites.

A final factor in an examination of settlement patterns is that there is an apparent tendency for sites to cluster. In the Colstrip area where approximately 196 km<sup>2</sup> have been surveyed there appear to be six clusters of sites (Figure 17). On-going inventory and excavation will provide better definition of these clusters which generally contain sites representing a variety of activities relating to daily tasks. Kill sites are included within several of the clusters. Most of the clusters exhibit evidence of use during the last 4000 years which suggests that there is a combination of ecological/geographic setting or particular resources to attract the human groups. In some cases it is difficult to determine exactly what combination of attributes allowed or encouraged this clustering.

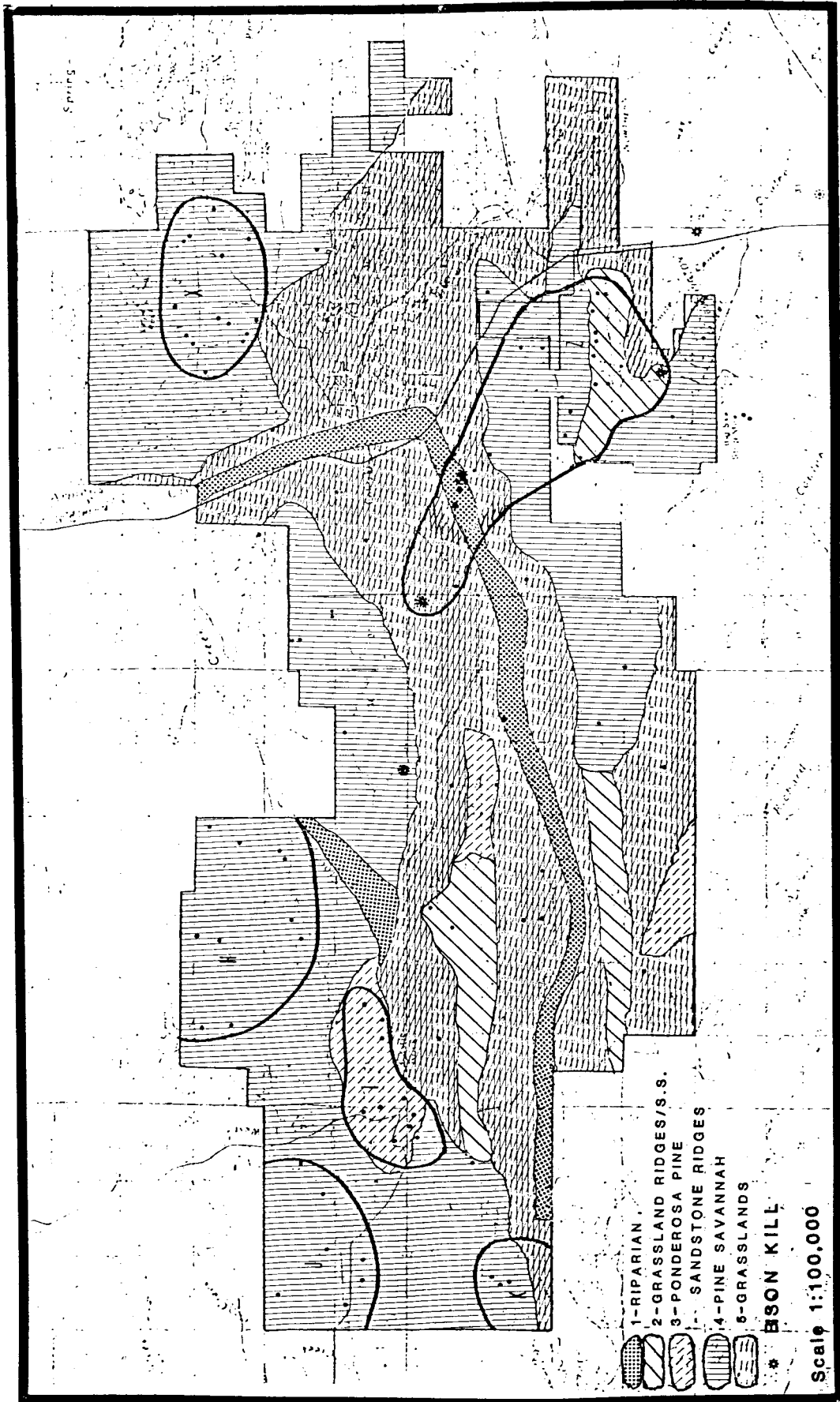


Figure 17. Sites (shown by dots) and site clusters in the Colstrip, MT area. The clusters are superimposed over ecozones. The Old Homestead-Peabody cluster is in the lower right (Z). Borders mark the extent of inventoried lands. (Compiled from L. Fredlund et al 1980: Figures 10, 10A, 10B, 78 and USGS Forsyth MT 1:100,000 Quad 1979)

The site clusters near Colstrip are located at a sensible distance from each other with respect to hunting pressure and vegetal food collection. They are approximately 6 km apart and generally contain sites in all topographic locations. Each cluster appears to be situated where exploitation of several drainages can be easily conducted. One of the clusters has received a considerable amount of archaeological work and is discussed in some detail in order to provide an example of the information which can be gained by examining clusters as a whole and how clusters aid in interpretation of the Late Prehistoric settlement pattern.

The Old Homestead/Peabody cluster (Figure 17-Z) is located so as to exploit the area of the Armell's Creek drainage (which is currently an area that is highly regarded as winter pasture because it is relatively devoid of winter snow), Emile Coulee and the side valley of Rosebud Creek. This cluster contains four bison kills, at least four occupied rock shelters, four petroglyph sites, extensive campsites, and a variety of other site types. Temporally most of these sites can be placed in the Late Prehistoric period although Late Archaic and one Middle Archaic site is represented. Three of the bison kills, three rock shelters and several open occupation sites have been excavated.

Sly Bison site (Steere 1980) fits within Late Prehistoric Period I (A.D. 300-500). Only the processing area was excavated but the associated bone bed suggests an arroyo kill. Evidence of Expanding Flake Point manufacturing comes from the recovery of preforms and flakes which are part of this production system. The Old Homestead Kill (Munson 1980) and BLM Bison Trap (Ekland 1974) are suggested to be possible snowdrift kills. They were associated with Plains and Prairie type points and are placed into Late Prehistoric Period II. The same cluster contains

Engineer Shelter (S. Munson 1981), Horse Shelter, Colt 45 Shelters (D. Fredlund 1973) and Timi's Shelter (Munson and Munson 1980). Horse Shelter contained small corner-notched points and dated  $1645 \pm 120$ : A.D. 335 (GX-2556). Colt 45 was stratified: the earliest level dating A.D. 20 and A.D. 45, the second A.D. 710. Preforms and various SSNA points were associated with bison, deer, and a small assortment of chipped stone tools. Engineer Shelter was occupied briefly three times and no diagnostic tools were found in any of the levels. These dates are:  $510 \pm 40$  years: A.D. 1440 (TX:4206);  $1690 \pm 60$ : A.D. 260 (TX:4041); and  $1900 \pm 50$ : A.D. 50 (Munson 1981). Timi's Shelter was tested and appeared to have been occupied several times. A charcoal lens, possibly the edge of an unprepared hearth, yielded a radiocarbon date of A.D. 760. Two scrapers, a grinding slab and an unprepared sandstone hearth (A.D. 450) were reported at the Vegematic site. This open occupation suggests a specific activity of short duration associated with food processing. The only well-dated Late Archaic site is the Dead Cow site, a creekside occupation, which was large in area but shallow in depth. Features were almost totally weathered away but two were dated at 250 B.C. and 40 B.C. (Munson and Munson 1980). Sites which appear to be base camps for Late Archaic and Late Prehistoric are Dead Cow and four others in the pine-sandstone ridge ecological zone. (Table 10 lists radiocarbon dates associated with the Old Homestead-Peabody cluster.)

What can be interpreted from this is that Late Prehistoric period groups using small corner-notched, presumably arrow points were occupying the area at approximately the same time (ca. A.D. 300-400) as groups using the Expanding Flake Point Tradition, exemplified by Horse Shelter



Table 10. Radiocarbon Dates From Cluster Z - Old Homestead/Peabody Cluster

Site	Date	Accession No.	Author
Colt 45 24RB1012			D. Fredlund 1973
Component I	1930 ± 120: A.D. 20 1905 ± 100: A.D. 45	GX-2559 GX-2557	
Component II	1240 ± 100: A.D. 710	GX-2558	
Component III	No date		
Component IV	less than 200 years ago	GX-2561	
Horse Shelter 24RB1011	1645 ± 120: A.D. 335	GX-2556	D. Fredlund 1973
Timi's Shelter 24RB253	1190 ± 90: A.D. 760	TX-3605	Munson and Munson 1980
Dead Cow 24RB1005	2200 ± 80: 250 B.C. 1910 ± 100: 40 B.C.	TX-3667 TX-3668	Munson and Munson 1980
Vegematic 24RB262	1500 ± 70: A.D. 450	TX-4042	S. Munson 1981
Engineer's Shelter 24RB1024			S. Munson 1981
Level I	510 ± 40: A.D. 1440	TX-4206	
Level II	1690 ± 60: A.D. 260	TX-4041	
Level III	1900 ± 50: A.D. 50	TX-440	
Old Homestead Kill 24RB1014	850 ± 50: A.D. 1100	TX-3148	Munson 1980
Sly Bison Site	1620± 200: A.D. 330 1410± 50: A.D. 540 1600± 100: A.D. 350	TX-3782 TX-3785 TX-3786	Steere 1980

and the Sly Bison Kill, respectively. At the present time no bison kills known in the area contain small corner-notched points. This suggests that with the Expanding Flake Point Tradition there was an increase in mass killing of the animals. The apparent pattern of settlement was to select open air settlements, often along creeks prior to the first century A.D. At this time living in small rock shelters became more popular.

The Old Homestead/Peabody cluster provides evidence of Late Prehistoric bison procurement from A.D. 300 through at least A.D. 1200. Although no seasonal information was gained, snowdrift kills are postulated for Old Homestead (Munson 1980) and BLM Bison Trap (Ekland 1974). Both the Sly Bison and McCrae kills (the fourth kill site in this cluster) are in arroyos. Although there is evidence of considerable prehistoric activity along Armells Creek very few of the sites can be temporally classified. The creek side activity is thought to represent plant gathering, water procurement and possibly hunting. The creeks, essentially devoid of deciduous trees today, would probably have contained a variety of trees, shrubs and grasses in the past some of which could have been collected for food. Beaver and muskrat would have been active and a larger riparian zone might have existed. Thamer Decker, an old timer in the area (personal communication 1973), reported catching fish and trapping muskrat in this area of Armells Creek.

In cluster Z the high broken and protected sandstone rimrocks and pine ridges had the highest number of sites (Munson and Munson 1980:347). Larger sites indicating camping, material testing and procurement, and rather intensive occupation are found in these areas. For the grasslands, the largest ecological zone in the cluster "the primary activity may be

small isolated kill/butchering loci". They consider:

...the lack of prominent sites in this large phytozone as evidence that the prehistoric inhabitants intentionally did not use it for occupation. The high number of indistinct [small, isolated clusters of lithics] sites reflect this movement into the zone for hunting (Munson and Munson 1980:347).

This is the only cluster that has had much archaeological work and thus it has been emphasized. It is, however, an example of what may be gleaned from the others.

### Food Procurement

Discussion of food procurement and the subsequent treatment of this food brings up the question of whether Late Prehistoric groups were "foragers" or "collectors". Although there is a great amount of seasonal intergrading the difference is significant in that one reflects a more detailed, planned availability of food. Foragers:

typically do not store foods but gather foods daily. They range out gathering food on an "encounter" basis and return to their residential bases each afternoon or evening (Binford 1980:5).

In marked contrast to the forager strategy where a group "maps onto" resources through residential moves and adjustments in group size, logistically organized collectors supply themselves with specific resources through organized task groups.... Collectors are characterized by (1) the storage of food for at least part of the year and (2) logistically organized food procurement parties (Binford 1980:10).

There are two primary goals of hunter-gatherers (Jochim 1976:15-45). The first is to maintain a secure and reliable supply of necessary resources. If possible, these resources should include good tasting and a variety of foods. All hunting strategies, camp movement, settlement locations, and social structure are adaptive mechanisms to achieve this

aim. (In modern society this is, in effect, the search for "quality of life".) This means attaining the primary goal with a minimum of expenditure of effort.

Evidence for Late Prehistoric groups of the Northwestern Plains being collectors is considerable. The most obvious being the evidence of communal bison procurement at the many buffalo jumps and surrounds found throughout the plains. The number of animals killed, the associated processing areas, and the relatively common nature of this type of food procurement strategy strongly implies a logistically organized food procurement strategy. The meat from such a large kill was then either dried or frozen depending on the season of the year. For the Nunamiut, Binford (1978b) observed that animals killed during the winter were field butchered and cached until food was needed. When such need arose trips were made to the caches and the amount of meat required was removed.

Generally on the Northern Plains the meat from bison kills is assumed to have been dried. If the weather was cold, the meat would freeze before it could be cut into small strips for drying and consequently this very practical solution to food preservation must be considered in dealing with human coping strategies on the plains. Drying of meat during warm weather would have been a relatively painless and successful means of food preservation, since the dry air of the Northwestern Plains would enable food drying to commence rapidly. Plains ethnohistoric reference is often to pemmican making while drying and storage of jerked meat is rarely mentioned in any detail (e.g, Grinnell 1972:250).

Evidence of drying or caching of meat has not been found in archaeological context. Rock cairns, an enigmatic feature of the Northern Plains, might in some cases be related to food storage, but this is very

difficult to prove. The cairns found on the plains are generally much smaller than those described by Binford (1978:240-241) for the Nunamiut. However, winter caching of meat could be similarly conducted as by the Nunamiut: the animal(s) killed is field butchered, the location of the cache is chosen where snow would not drift and bury the cache, the meat pieces are covered by the hide, and the head with the antlers up. Snow is scooped up and laid around the base of the hide. The manner in which the animal is butchered depends somewhat on the weather, since frozen meat is difficult to cut into smaller pieces with stone tools. Archaeological evidence indicating a winter cache location would be minimal or, more likely, non-existent. A problem in applying the caching concept to the Plains is that there were more predators to contend with than in the Arctic.

Caching or storage of items other than meat is known archaeologically for the Northwestern Plains. Keyser (1979) reports three sites in northcentral Montana which contain evidence of such storage. He reported a pottery cache, where two vessels were found under a sandstone ledge (Keyser 1979:41-42). (It is not mentioned that they contained anything. One wonders if the vessels held food or were just stored empty because they were an encumbrance to travel.) Storage pits were also reported at camp/butchering/processing areas related to the Fresno and Kremlin Kill sites (Keyser 1979:64, 76). For the Pine Breaks area no such pits have been reported. While cache pits are generally assumed to be associated with more sedentary peoples their presence should not be unexpected.

If frozen food caching was a normal adaptive process for the North-

western Plains groups, and it seems only feasible that this was the case, winter camps would be expected to be more permanent than summer camps because of the ease of food storage. From the Pine Breaks there is some evidence, although tentative, to support this. The BLM Bison Trap (Ekland 1974) and the Old Homestead Kill (Munson 1980) sites seem to represent the killing of bison by driving them into a snow bank. Both sites are on the northeast facing lee of a hill where snow accumulates to relatively great depths. If these sites were indeed winter kills, then the storage of meat would be no problem. Limited butchering activity would be expected at the site. No extensive butchering areas were found to be associated with either site.

Benson's Butte contained little information suggesting the season of occupancy. Based on the flimsy available evidence, it is suggested that the site was a late winter or early spring occupation (Fredlund 1979:232). The reasons for this seasonal classification are: the presence of a semi-permanent rock-walled dwelling structure; a foetal bison calcaneous and prairie dog remains. Prairie dogs come out relatively early in the spring and could provide an excellent emergency food source. The site is near an antelope wintering ground, and could have been so in the past. Also:

... the occurrence of all parts of adult bison at the site suggests that partially butchered remains were brought back by the hunters. Unless a vehicle (e.g., dog travois) was utilized for this task it would be a difficult endeavor to move these large portions of the animals great distances. However, in the winter, it would probably be much easier to move large items with the use of sleds or tobaggans (L. Fredlund 1979:232).

A relatively simple "toboggan" could be made by placing the meat on the hide and dragging the hide. The meat would be frozen and would remain so. The above evidence for seasonality of occupation, although rather

inconclusive, is suggestive of winter occupancy and a relatively intensive or semi-permanent occupation at Benson's Butte.

Archaeological evidence relating to this food procurement and preservation hypothesis will come as better seasonal information is gained from excavated sites. Until such time as this information is available the strategies can only be suggested and must remain hypothetical.

### Hunting Strategies

Based on the archaeological record hunting strategies can be suggested for all seasons of the year. Support for the archaeological data is gleaned from ethnographic accounts of hunting strategies (e.g., Binford 1978a, 1978b, 1980; Grinnell 1972; Yellen 1977). For the Pine Breaks area, based on the archaeological record and observation of the area, D. Fredlund (1973) developed an hypothetical model for diurnal hunting and gathering activities. Fredlund noted that the Pine Breaks area contains two dominant landforms: the pine covered sandstone ridges and the grassy basins and valleys. Most predatory species (e.g., bobcats, coyotes, cougar, raptorial birds) live within the sandstone-pine ridge zone. Most human activity is concentrated in this zone as well. Conversely, the ungulates, the prey species, live primarily on the grasslands. Thus, there is a division; predators, including man, generally making their homes in the sandstone-pine ridge area, while the prey species remain mostly in the valleys and grasslands. This relatively simplistic division:

... provides a unique opportunity to examine a relatively simple interaction of the natural ecosystems (as determined by the topography) and the lifeways of the human inhabitants.

In order to exploit fully the available food and shelter resources, the inhabitants of this area in all probability attempted to blend into their environment with as little disturbance of the natural ecosystems as possible... a minimum amount of disturbance would have been caused by small groups of people who were able to utilize the area without even superimposing upon it their dwellings or trails. Conservative hunting and gathering techniques would have ensured a more long lasting supply of food in a single area.

Thus, by following a living pattern in many respects similar to that of other predators, the Late Prehistoric peoples in south central Montana found shelter and concealment along the ridges in favored rockshelters...or in small basins or draws, and near water. From the ridge tops and summits of these sandstone outcrops, they could inconspicuously observe the movements of large ungulates on the grassy basins and flats below, and plan a hunt which would create the least amount of disturbance. Hunters could then descend to the flats, use the dry washes as routes of entry and approach, kill, butcher, and return to the shelters of the sandstone outcrops with a minimum of disturbance (D. Fredlund 1973:67).

The archaeological record in the Colstrip area contains clusters of prehistoric activity. The distribution of the main sites (base camps, kills, etc.) plus the distribution of minimal activity locations produces information for interpretation of the hunting, and resource procurement pattern. These locations are the result of material testing, material procurement, observation stations, single kill/butchering spots, and unknown activities. In superimposing the distribution of these locations on the topography hunting strategies and other activities can be determined. These loci are often situated on the edges of the high ridges and rimrocks in a consistent pattern. Also in the pine-savannah zones such loci are on edges of hills and wooded areas and occur in a pattern. However, on the grasslands, and occasionally on the ridges or in the savannah country, they are found in an apparent random scatter over the terrain. The change in regular patterning suggests that there is reason for this deviation. Based on study of the lithics at minimal activity loci it is apparent that the deviation is caused by the exploitation of a particular resource (lithic outcrop, food resource) and, in some cases,



butchering an animal. It is the hunting, kill and butchering pattern which is focused on here. Three different types of hunting strategies are discussed with the assumption that tactics are not season specific and that all ungulates are available throughout the year.

This latter statement for bison may prove to be incorrect, but it can be suggested that, although migratory for much of the open plains country (Gordon 1979; Morgan 1978), the rough broken topography of the Pine Breaks would force the herds to break into smaller units to forage and these smaller units would remain in the Pine Breaks throughout the year. There is considerable evidence that bison break into smaller herds and winter in rough broken country like the Pine Breaks, e.g., Arthur (1975), Hind (1971), Henry (1969). On the Canadian prairies both Gordon (1979) and Morgan (1978) have made a strong case for the relative stability of bison movement patterns and human adaptation to this movement. In superimposing similar patterns of movement for the main bison herds in Wyoming and Montana, I am not convinced that such a dispersal of animals over such a large area would be the case. The number of small mountain ranges, basins and broken country such as the Pine Breaks would tend to disrupt large herds. Unquestionably there is seasonal movement -- to the open plains in the summer and back to the foothills or broken country in the winter -- but in Wyoming and Montana the animals don't have to travel as far to find such forage and they must remain in smaller herds to deal with the smaller areas of winter ecosystems. In the Hayden Valley in Yellowstone Park, the grasslands are broad and separated by high hills and pine forests. Although certainly different from the Pine Breaks area the topographic relief and the wide grassland valleys are comparable. Bison were observed in October to be in herds of up to 25

or 30 individuals, and on down to groups of two or three or even a lone animal. It is easy to see how, with some planning, using the hunting strategies derived from archaeological information in the Pine Breaks area, it would be fairly easy to plan a hidden approach, shoot an animal, butcher and care for the meat, and cause little if any disturbance to other bison in the area. Assuming the presence of similar small herds, this same strategy would have been appropriate in the Pine Breaks.

Logical prey for most of the hunting strategies would have been bison, antelope, white-tail, mule deer, or elk. Figure 18 illustrates the various techniques. The first technique considered is strictly fortuitous, encounter hunting. This would be primarily for mule deer in the pines and whitetail deer in the riparian zones. However, the hunter would watch for other prey as well. As White Hawk states, "Men were always out from the camp looking for food" (Grinnell 1972:265). The hunter(s) would move quietly, stalking, through the pine ridges and pine savannah country, or along a water course waiting to spot a deer or other prey species. At the same time he would presumably be observing the open grasslands from high knolls or ridges as he moved along. Silberbauer (1972:290) notes that for the G/wi:

... most hunting is done by men working in pairs, making sorties of a day or less from the band's camp. Before going out the hunters discuss their intentions and arrange their plans so as to avoid interference of one party by the others.

If a kill is made by stalking in this manner, the animal would be field-butchered and the meat carried back to camp or cached. Field butchering would depend on the size of the animal, the time of the year, and the number of people available to haul the animal back to camp. Such field butchering might yield limited archaeological evidence in the form of

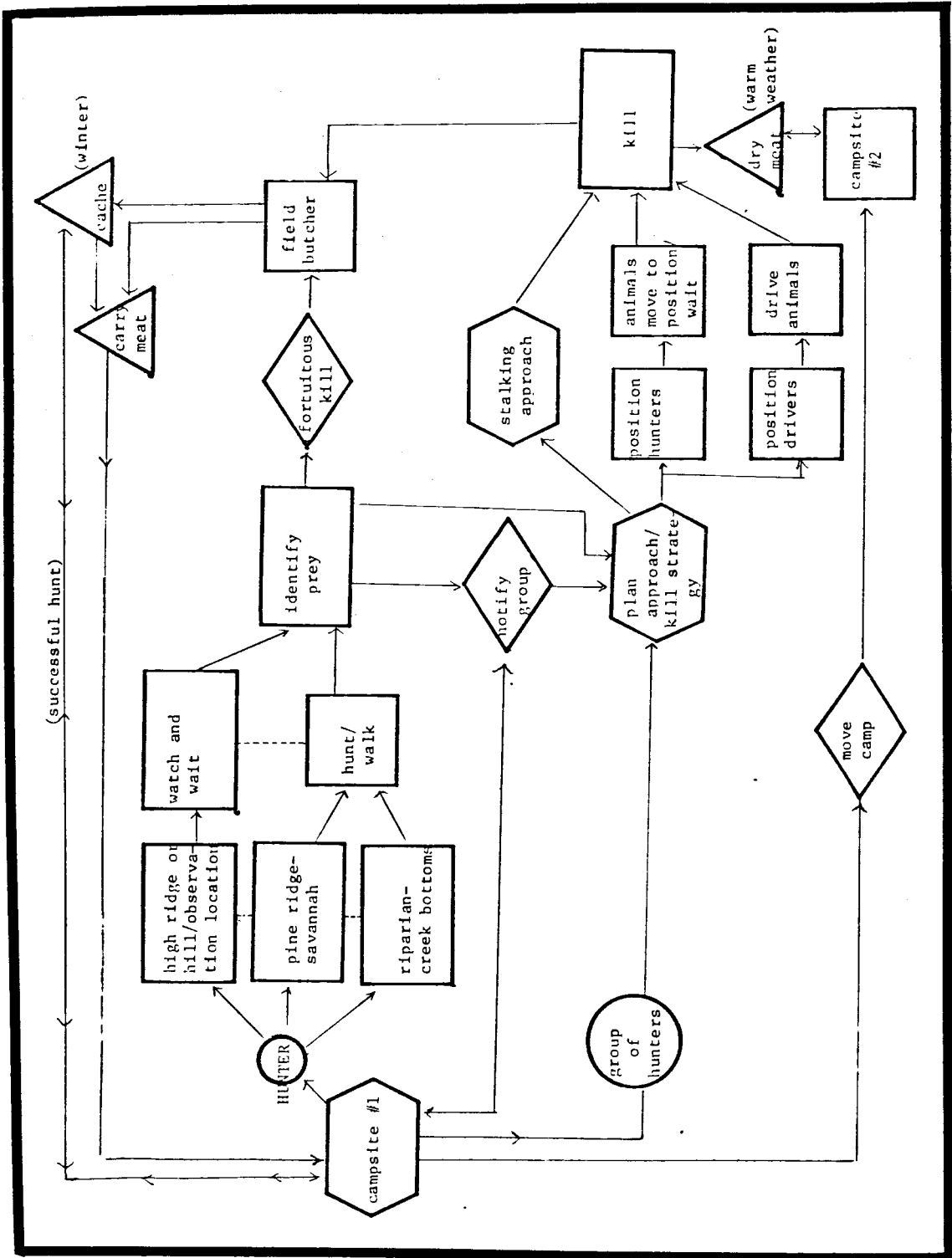


Figure 18. Model of hunting strategies used in the Pine Breaks.

butchering tools, or several flakes which had been removed to sharpen the tool.

When a hunter spotted an animal or herd of animals on the grasslands, he would make a decision on how to best go about the kill; how many hunters would be required (based on how many were available), how much meat was needed and could be consumed or preserved, and whether the kill strategy was worth the risk of scaring the animals and sending the herd into another valley, farther away. The distance, speed and direction of movement would be judged. The encounter and kill location would be decided. There is a distinct advantage to not disturbing herd animals since, while in the area, they provide a continuous supply of meat. If the herd is spooked, the group might be forced to move base camp or the hunters would have to haul the kill from a greater distance. Either action would take a considerable amount of effort. When animals are spotted, the hunter observes and takes into consideration:

... size and position of the herd, whether it is resting or grazing, quietly or nervously, the disposition of the sentry animals and many other factors. The preferred target is an animal on the flank, somewhat downwind of the herd....The hunters plan their approach, taking into account the wind, the state of the herd, and the cover lying between them and the herd (Silberbauer 1972:291).

Although the above quote is relating to herd animals in Africa it is equally applicable to hunting on the Northwestern Plains.

Another hunting strategy can be called the "watch and wait technique." The high rimrocks above the valleys of the Pine Breaks area make this type of hunting a relatively easy task. Walking the rimrocks above the valleys allows observation of the valleys. Often the ridges between valleys are rimmed on both edges by sandstone with no more than 1 km of flat grasslands between rim edges. To his advantage a hunter could,

with very little effort, have an adequate view of two drainages without traveling more than 1 or 2 km in a day. Presumably stalking encounter hunting would generally be combined with observation of the valleys. However, if food was plentiful and there was no pressure to actively hunt, it is presumed that the observe and wait strategy would be employed.

As noted above, the archaeological evidence for such activity is found along rimrocks and on high points with a good view. There almost always is a string of lithic debris with few tools. Utilized and retouched flakes often exhibit some edge wear. There is rarely any evidence of long or short term camping at these locations. Archaeological evidence on the grasslands is represented by isolated tools, an occasional grouping of a few flakes generally representing direct percussion work. These scattered isolated locations of prehistoric activity are considered to represent locations of kill/butchering or evidence of some type of gathering activity. The sites are scattered and seem to have little or no pattern as would be expected from kill locations. The description of the observe and wait strategy for the Nunamiut shows that many activities are performed at the observation stations while waiting for the caribou to come through. Tool repair, tool making, gaming and drinking tea are normal activities, and remains of these activities are found in the observation areas (Binford 1978a;1978b).

The third type of hunting strategy is communal procurement, requiring planning, possible construction of a surround or drivelines, choosing a location, mobilizing a relatively large group of people, and controlling a bison herd. This has been discussed at great length in relation to some of the large scale bison kills, e.g. Glenrock (Frison 1970b), Bootlegger Trail (Roll and Deaver 1978), and need not be repeated here.

Variations in this communal hunting strategy would occur for antelope which can be trapped (e.g. L. Davis and Fisher n.d.; Frison 1971b) or enticed in other manners. Frison (1978:251-257) discusses antelope habits and hunting strategies at length. Rabbits or hares can be driven, Shoshone fashion (Steward 1938). Prairie dogs, marmots or other large rodents could be killed by clubbing or other means. Gallinaceous birds are found in archaeological context and were, presumably, trapped or clubbed. Thus, although strategies aimed at obtaining the largest amount of meat with a minimum of effort were the rule, they could also be supplemented, and it is presumed that the smaller animals or birds were taken when possible. For example, prairie dogs would have been generally available considering the number of prairie dog towns on the Northwestern Plains. The presence of the dog towns in the Benson's Butte area today and in the cultural deposits suggests that they were indeed used by prehistoric groups.

### Gathering Strategies

Although gathering of plant food is considered to be important to the Late Prehistoric occupants, little evidence in terms of seeds or other floral material has been recovered archaeologically. Grinding slabs, suggesting processing of seeds and vegetal materials, are not uncommon at campsites, but the specific foods used are still hypothetical. Gathering activities over the landscape would be expected to leave little or no archaeological remains. Numerous tubers, berries, and other collectibles exist, and we presume at least some were used. Until evidence of such use is found in sites we can only speculate on the species.

## Food Processing

As mentioned above, processing of vegetable foods or dried meat by grinding is suggested by grinding slabs and manos found in archaeological deposits. At the Vegematic site in the Old Homestead-Peabody cluster grinding slabs were found with little other artifactual material suggesting food processing at that location. The drying or caching of meat has been discussed in detail above. Preparation of food items prior to cooking has also been covered in the above discussions.

Cooking the food, however, is evidenced by a variety of different types of features representing stages in food preparation. At Benson's Butte, small rock shelters such as Colt 45 or Horse Shelter, the Wardell site (Frison 1973), the Old Homestead Kill (Munson 1980), the Sly Bison site (Steere 1980), features reflecting various types of food preparation are present. Several of these will be discussed.

At this time there are essentially three recognized primary means of food preparation apparent in Late Prehistoric sites: stone boiling of food, roasting in a rock lined pit, and quick cooking of foods on the surface of a fire. The first type of cooking is best described from the Happy Hearth site in the Pine Breaks area west of Colstrip (Fredlund and S. Munson 1981). Two features were found within 1 m of each other. One contained a 4 cm lens of charcoal-stained and heat-reddened soil with a few burned sandstone slabs on the surface and small fragments of burned sandstone within. The second feature contained only fire-burned sandstone of much smaller size with no charcoal or burned soil. It is presumed that the sandstone was heated and removed from the first feature to be used to

cook food in a pouch or bag or perhaps on the hot rocks alone. There was little else at the site, suggesting a very temporary camping situation.

Rock-lined pits for roasting, presumably meat, are relatively common in sites from the Middle Archaic through the Late Prehistoric. These roasting pits usually are lined with rocks. Sometimes charcoal is found at the bottom and throughout the feature, suggesting that the fire was built in a pit, the hot rocks lowered over the top and other rocks and perhaps a second fire started on top. At the Wardell site Frison reported one such pit which had been covered and the remnants never removed. When such pits are found a second type of feature is often associated. This is a relatively large and shallow lens of charcoal, bone, fire-burned and broken rock, and occasionally burned artifacts. These features are thought to represent the material result of cleaning out the roasting pits. At Benson's Butte the lower portion of one of the roasting pits yielded a radiocarbon date of 2000 B.C. This was much earlier than most similar pits, and suggested, not only that similar cooking practices had been in use for 3000 years, but also that the pit had probably been in use, with minor modification and reconstruction since that time. Evidence of this is also documented by Syms (1974) who describes a large pit which had been used by several different groups over the years at DgMg 15.

The third type of food preparation is in shallow hearths. The food is presumably cooked on top of the fire. At the Lonely Hearth site a fire was built in a shallow basin-shaped pit and allowed to burn. Sandstone slabs were then placed on top of the charcoal and burning wood and, presumably, the food was placed on top of this "grill". This hearth was radiocarbon dated at  $940 \pm 80$  years: A.D. 1010 (TX-4168). This site



is another temporary camp with one hearth and very limited lithic debris. Of particular interest at this site is that the wood in the hearth was identified as ponderosa pine, juniper and Douglas fir. Pine and juniper trees are today at least 1 km from the site. Douglas fir, however, grows at least 12 km distant. It is presumed the wood, which can be fire-hardened easily, was part of a tool handle or a digging stick. Either the treeline was closer to the Lonely Hearth site in A.D. 1010 or the wood was hauled a considerable distance.

A seasonal consideration for firepits is that they cannot be excavated in the winter because frozen ground would discourage such activity. Similarly, hard ground in the summer would force occupants to make shallow pits for fires. It is presumed that large roasting pits would only be used on locations with relatively soft soil, as in the sandy locations so often chosen for campsites in the Pine Breaks area.

### Lithic Procurement Strategies

In an area such as the Pine Breaks where stone for tool manufacture is abundantly available, literally on every ridge, the archaeological remains are extensive. Porcellanite, being the local material, makes up 90-100% of the lithic material on most sites. The remaining material comes from river gravels or is carried in from Phosphoria Formation or other chert sources in the Bighorn Mountains. These cherts are more common on sites on the southern portion of the Pine Breaks area which is no more than 100 km from the Bighorns. At the present time there is no apparent distinction between lithic procurement techniques in the Late Prehistoric or Late Archaic.

Archaeological remains indicate essentially two approaches to procuring porcellanite for tool use. The first is similar to one of the hunting strategies: a fortuitous encounter. This occurs, possibly during hunting activities where a person notes a small porcellanite outcrop, picks up a piece and knocks off a flake. The purpose of this activity is, presumably, testing of the material. Often relatively extensive areas of lithic debitage of low density are noted in the vicinity of these small outcrops. Usually few tools are found and few small flakes from finishing a tool. Another type of site consists of a large amount of lithic debitage in a small (2 m<sup>2</sup>) area. This is interpreted as being a location where a core was reduced and either a tool, blank or preform were made. This latter type of site is generally on the edge of a high rimrock which is a good observation location. It is presumed that this activity is often coincident with the "watch and wait" hunting strategy. One such location contained ten large spalls which were collected and the original core rebuilt. One large flake was missing -- obviously the chosen specimen by the knapper (Herbort, personal communication 1981). A similar situation was observed on a Tertiary gravel surface in northern Wyoming. The lithic material was collected and the basalt cobble (the core) rebuilt. In several cases the missing pieces were picked up at other nearby sites (Munday 1980).

The other lithic procurement technique in the Pine Breaks is similar to any quarrying/lithic procurement activity at other quarry sites. This activity relates to locations which contain porcellanite of high quality. In the Colstrip area there are several large quarry complexes which provide evidence of extensive prehistoric collecting and testing. Archaeological remains at these locations are similar to that reported

at other quarry sites, e.g. Devil's Eyebrow (Tro and Tro 1968), Schmitt (L. Davis 1977), Palmer Quarry (Herbort 1981c) with no evidence of sub-surface extraction of the material. Actual excavation or "mining", although common to chert quarries, has not been observed at porcellanite outcrops in the Pine Breaks area.

In summary, it is the fortuitous encounter technique of lithic procurement that leaves the primary archaeological evidence in the Pine Breaks area. This activity leaves large numbers of small activity locations which contain 3 or more flakes, the result of testing from a single incident or several incidents through time. From the 181 sites examined 34 are classified as material testing, lithic procurement or "workshop" sites. In the Old Homestead Kill - Peabody Cluster 60% of the sites and the loci were so classified. As noted previously, the Expanding Flake Tradition is well-suited to areas with lithic material of marginal quality. Further study of the material testing and collecting locations should enable better definition of Late Prehistoric lithic procurement by the study of the debitage.

## Chapter 8

### THE PINE BREAKS AND THE NORTHWESTERN PLAINS: SUMMARY AND CONCLUSIONS

The relationship of Late Prehistoric human populations living in and around the Pine Breaks to those populations of the Northwestern Plains in general raises several questions: 1) is there an indigenous human population in the Pine Breaks; 2) are the Pine Breaks used seasonally or on a scheduled basis by human populations; and 3) do the Pine Breaks act as a barrier in any manner to the north-south movement of human or animal populations? Encompassing these questions is the role of the Expanding Flake Point Tradition and its effects on archaeological interpretation.

#### Indigenous Populations

If there is an indigenous population in the Pine Breaks during the Late Prehistoric period the archaeological evidence should contain sites with some homogeneity in patterns of settlement and adaptive strategies. The Pine Breaks covers an area of approximately 100,000 km<sup>2</sup>. Within this area there should be evidence indicating year round use. Features and tool types somewhat distinct from the Plains in general should be noted. There should be a predominant utilization of local resources.

Presently there is little seasonal data available for the sites which have been excavated. Seasonality in relation to Benson's Butte, the Old Homestead Kill and the BLM Bison Trap have been discussed as probable winter or early spring occupations. Rockshelters are often

assumed to be winter habitations. They are easy to heat in winter, however, they also are cool in the summer. Sites located great distances from water could be explained as relating to a season with some snow accumulation. The creeks would be frozen at this time and would not be the primary water source. Wood for dwelling construction and heating would be readily available and the sandstone could provide radiant heat in the winter. Many of the sites have shallow hearths suggesting that no excavation was undertaken for preparing food. This might be suggestive of winter occupancy. Consequently, a more intensive, semi-permanent occupation in the winter months, where the human groups subsisted partially on cached or prepared food can be hypothesized. It is assumed that bison would winter in the Pine Breaks, if they did not remain there year round. During months the ground was relatively free of snow (March-November) the human populations might tend to be more mobile and to forage for their food outside the Pine Breaks.

Arguments for year round occupation are several. The Pine Breaks contain numerous permanent water sources compared to the open plains. These often take the form of seeps coming from coal seams. Grinding slabs and manos are not uncommon at sites. These slabs, commonly made from local sandstone (L. Fredlund 1979:216), are often associated with grinding and processing of grains, berries and other vegetable foods. This would indicate spring-summer-fall use. However, pemmican was made for immediate use, presumably year round by the Cheyenne (Grinnell 1972:256), and required a mano and metate to pound the dried meat and berries. Consequently, the mano and metate could be used in winter months as well as for vegetable foods in summer. Finally the extensive tree coverage would provide shade and shelter

sun.

Although there is a slightly greater argument for winter occupation in the Pine Breaks, there are some arguments for living year around. This suggests that if there are indigenous groups they could exist with few changes from winter to summer.

In examining projectile point styles for the Late Prehistoric period there is little distinction between the SSNA points used throughout the Plains and those in the Pine Breaks. Only between Avonlea and Avonlea-like points is there an apparent geographic variation. In form the Avonlea-like, or degenerate Avonlea, points have slightly deeper notches and a wider range of variation. However, more recent data indicate that there is a tendency for greater variation in point type from Avonlea through the Prairie and Plains types. This is particularly evident in the Pine Breaks area and south into Wyoming, e.g., Sly Bison site, Benson's Butte, Arrowhead Rock, and Wortham Shelter. It is difficult to classify a site as to a more exact time period than just "Late Prehistoric" in the Pine Breaks but, as noted in the re-evaluation of the cultural chronology and projectile point typology this is proving difficult throughout the Northwestern Plains. The mixtures of Avonlea with Prairie side-notched varieties in bison kills is a common phenomena e.g., Estuary (Adams 1977), Morkin (Byrne 1973), and Gull Lake (Kehoe 1973). The associated radiocarbon dates range from A.D. 500 to A.D. 1200. This variation is intra-site and intersite. Intra-site variation is suggested to be connected with site function and amount of scheduling and "gearing up" necessary or possible for a particular activity. For instance, a bison kill which is a seasonal occurrence can be planned, tools prepared, and people mobilized. Such planning was not a factor

at small fortuitous kills and greater variation in tool types would be expected. Point variation occurs from breakage and reworking, the abilities of different individuals, varying types of raw material, and from the amount of preparation time involved. Although all Late Prehistoric sites provide evidence of the expanding flake point manufacturing system the inter- and intrasite variation, apparent most readily in the Pine Breaks, cannot be explained simply through geographic distribution. Point typology is only relative and radiocarbon or other absolute dates are essential for accurate classification. The general similarity of the points and the evidence of the use of the expanding flake tradition of arrow point manufacture throughout the Plains, gives little support to an indigenous population in the Pine Breaks.

Most tools reported at Late Prehistoric period sites are not distinctive to the Pine Breaks. However, several distinctive items were reported at Bensons Butte: smooth, rounded flake tools and excavated bison phalanges. The former have been found at two other sites in the Youngs Creek area adjacent to Bensons Butte, while the latter was first reported from Pictograph Cave III (Mulloy 1958).

Local resources are dominated by the distinctive porcellanite formed by burning underground coal seams baking the surrounding clays and shales (D. Fredlund 1976). This material is available on almost every ridge. The use of "foreign" materials is unusual and when found in any amount on a site it is notable. If use of local materials is a factor in supporting an indigenous Pine Breaks population during the Late Prehistoric period then all presently known sites are part of an indigenous population. However, porcellanite is found occasionally in western Montana, 500 km to

the west. It is not a material of such quality that trading would be expected. Indigenous collection is the manner of acquisition and it is assumed that the collector transported the material. At Benson's Butte, Big-horn Mountain cherts from the Phosphoria Formation are second to porcellanite in frequency. This is suggestive of ties to the south and to the Bighorns.

The only tool which is made of "foreign" material consistently is the end scraper. These were apparently curated items. Only a very small percentage of those recovered are of porcellanite which is either too soft or brittle to make a good scraper. At Benson's Butte, for example, only 25% percent were porcellanite with the remainder being chert to chalcedony.

With two exceptions features at sites in the Pine Breaks generally do not appear to be significantly different than those found throughout the Northern Plains. The first exception is rock art motifs. Recognition Rock, a large sandstone outcrop near Colstrip, contains a number of petroglyphs which are distinctive and generally confined to the Pine Breaks area. These specific motifs are found at several other sites near Colstrip, e.g., Ellison's Petroglyph, Davidson Microcave, and, recently, at sites in the Pine Breaks area in northwestern South Dakota (Stuart Conner, personal communication 1980). Conner has not observed the South Dakota sites but, based on photographs, feels there is a great resemblance to the Colstrip motifs. The distinguishing criteria are certain embellishments to rather standard glyphs. This information, although not detailed as yet, is very supportive of the indigenous population theory primarily during Period II and Protohistoric times.



The second distinctive feature is the dwelling structure at Benson's Butte. The only other known structure of this nature is at the Beehive site in northern Wyoming. No other features are apparently distinctive to the Pine Breaks area. Rather the hearths, stone circles and other features are part of the general Northwestern Plains archaeological assemblage.

In summary, the evidence for an indigenous Late Prehistoric population in the Pine Breaks is: use of local lithic material to the general exclusion of all others, and Late Prehistoric Period II rock art motifs. The evidence that the Pine Breaks inhabitants are participating in the overall Northwestern Plains traditions is overwhelming. The Expanding Flake Point Tradition is apparent in the area beginning ca. A.D. 300. Group bison kills are represented at this time with increased use of small rockshelters. Several sites appear to have a distinctive adaptive pattern and several specific traits. These sites are not limited to the Pine Breaks, but are part of a wider complex extending into the Bighorn Mountains and south into Wyoming (i.e., the Benson's Butte - Beehive complex).

#### Seasonal vs. Scheduled Use

As discussed above there is limited evidence to suggest that an indigenous population lived in the Pine Breaks during the Late Prehistoric period. However, there is some evidence that the Pine Breaks was occupied as a winter retreat. Bonnicksen and Baldwin (1978) examine ethnohistoric seasonal and scheduled use of the Cypress Hills and other "outlier" mountain ranges. They conclude that various tribal groups exploited

the various resources at different seasons, respecting the intrusions of even rival tribes. Could a similar scheduled/ seasonal use model be applicable for the Pine Breaks?

The concept of "transhumance", the seasonal movement of human groups and selected ungulates from the valleys to higher elevations, has been suggested as applicable to the mountains of Montana by several researchers. For example, Arthur (1966) applied the concept to the Upper Yellowstone drainage. Loendorf (1967, 1973) based his interpretation of the settlement pattern of sites in the Clark's Fork of the Yellowstone and in the Pryor Mountains on such a model. Although the term is essentially incorrectly applied there appears to have been a seasonal trek to the Bighorn Mountains relatively frequently from Benson's Butte. This would mean a move of approximately 100 km and an elevational change from 900 m to 2700 m. For the groups living around Colstrip the distance is considerably greater, entailing a move of 300 km.

In attempting to use a transhumance model yet adjusting it to the Pine Breaks, Beckus (1976) hypothesized that the inhabitants of the Pine Breaks near Ashland followed a seasonal movement pattern from the Tongue River valley (1000 m) to the high grasslands of the Custer Forest or Wolf Mountains (1300 m). Although stretching the concept since the altitudinal variation is no more than 600 m from the river bottom to the highland, it is probable that higher elevations were exploited during summer months and lower elevations during the winter months. The higher elevations of the Wolf Mountains receive considerably more snow than the lower altitudes. Presently ranchers in the highlands must feed cattle all winter. Access for feeding because of snow depth is often by sleigh or snow mach-

ine. In the lower elevations this is rarely necessary (Oscar Benson and Don Parks, ranchers: personal communication 1979). In the summer, however, the high grasslands are quite lush compared to the valleys and would have provided excellent forage for large ungulates such as the bison. Following this concept, if bison wintered in the river and creek valleys, some would conceivably have summered in the high grasslands of the low mountains within the Pine Breaks area. These would supply a summer food resource for an indigenous human population.

The occupation of the Pine Breaks on a seasonal (winter) basis is suggested and supported by limited archaeological data. However, the use of the area on a scheduled basis (Flannery 1972) can only be hypothesized at this time. In comparing archaeological information from the Pine Breaks with Thomas's (1973) depiction of the settlement/subsistence strategies and seasonal movements of the Shoshone in the Reese River valley, it was suggested that the seasonal and scheduled movement was based primarily on the sequence of the seasonal fruition of various plants and the annual cycle of greater to lesser herding of the ungulates (L. Fredlund 1976). There is , at this level of data collection, no way to deal with this concept and it will have to remain a question for future work.

## The Pine Breaks as a "Barrier"

Although certainly not a formidable barrier or wall to north-south travel there is the question of whether northern Plains-oriented groups crossed or their influence crossed through to the south. The Tongue River and Powder River proceed from the Yellowstone River to the Bighorn Mountains. It is presumed that these drainages would tend to channel human movement from the north to the south. Cross country travel as well would not be a problem to the Pine Breaks traveler. Why then do some specific human adaptive patterns appear to stay to the north, or begin south of the Pine Breaks? A northern trait which does not appear to be evident in the Pine Breaks is the large number of stone circle sites. A portion of a pipeline inventory in northern Montana yielded 25 stone circle sites (out of 28 sites) with 305 stone circles (Anthro Research 1979). Inventories recording 181 sites in the Pine Breaks reported 21 stone circle sites with 54 rings, an average of 2.5 per site.

Although considered to be within the Late Archaic rather than the Late Prehistoric, Besant sites are conspicuous by their near absence in the Pine Breaks area. Numerous such sites are found north, east and south but at present only one is known from the inventory work conducted in the Pine Breaks, and this from the southern fringe of the area.

The general absence of "classic" Avonlea, the appearance of "degenerate" or Avonlea-like, and the apparently greater variation of all point styles in the Pine Breaks is suggestive of alterations in the Plains projectile point chronology from the Pine Breaks south. However, as in the previous discussions the SSNA point variation throughout the Northern Plains and the varying dates associated with this distinction are subject

to change as more information is gathered on sites other than bison kills. The Pine Breaks might have acted as an ecologically distinct area and as such altered the flow of north-south physical movement or the movement of traits. If there were indigenous populations they may have maintained distinctive adaptive patterns of living and had limited interaction with other populations. The apparent emphasis by Benson's Butte - Beehive complex groups on fortification suggests there was some antagonism or cause for fear by these groups. Also the choice of the high rimrocks and sandstone ridges for living indicates the importance of observation of human and animal movements. These Late Prehistoric traits coincide with the expansion of the use of the Expanding Flake Point Tradition throughout the Plains.

#### Benson's Butte - Beehive Complex

Although tentatively defined at this time, there appears to be a distinctive cultural complex with a distinctive adaptive strategy from the southern Pine Breaks to northern Colorado. It is significant because it is the first time that such a complex has been discerned in the Northwestern Plains based on evidence other than projectile points. Although much of the data to tie this together has not been published, e.g., the Beehive site and Sly Bison Kill site, other sites which are listed here are a beginning in the definition of the complex.

This complex can be defined geographically as occupying an area which corresponds to the state of Wyoming east of the Rockies. The groups tend to restrict themselves to the foothills and mountains of the Bighorns and

broken sandstone ridge country, similar in topography and vegetation to the Pine Breaks. At the present time, Benson's Butte, Sly Bison Kill and Petrograph Cave III are the most northerly known sites. Serviceberry Shelter (Swedlund and Lageson 1970) is the most southwesterly site of the cultural complex.

Many of the sites are butte-top locations with the concept of protection and fortification being an important feature (Zeimens, personal communication 1980). At Benson's Butte, although no fortification structures were noted, the butte-top was accessible from one side only and would have been easily defended.

At the Wardell site Frison reports a ceramic style which he tentatively suggests might be Athapaskan. Zeimens (personal communication 1980) reports that this same type of pointed bottom pottery is found at several more of the Benson's Butte-Beehive complex sites. (To speculate on Avonlea-Athapaskan movement through Wyoming at this time with the fortified sites is interesting at best.)

The radiocarbon dates from these sites are clustering between A.D. 500-800, according to Zeimens. The radiocarbon dates from Benson's Butte encompass a greater range: A.D. 400-1000. Sites thought to be associated with this "Little known Late Prehistoric complex" (Frison 1978:72) are: Benson's Butte (L. Fredlund 1979); Drifter's Shelter (L. Fredlund 1975); Lone Ring (L. Fredlund 1981); Arrowhead Rock (Visborg 1961); Wortham Shelter (Greer 1978); Beehive site (Frison 1978: 71); Sorenson VI, Bill Greene and Mangus III (Husted 1969); Wardell (Frison 1973); Pictograph Cave III (Mulloy 1958); and Serviceberry Shelter (Swedlund and Lageson 1970). The latter site is interesting in that

Swedlund and Lageson note that the point types are not common to the area and have not been reported from amateur collections. Because of the uniqueness of the point type they see the presence of the materials "a significant archaeological problem" (Swedlund and Lageson 1970:144).

Specific characteristics of this complex are an extensive number of bone and stone tools. Projectile points made by the Expanding Flake Point manufacturing system are generally well-made, thin and have a wide range of variation. They resemble Avonlea, Avonlea-like, and Prairie and Plains side-notched. Possible diagnostic tools are smooth rounded flake tools (Figure 3) and bison phalanges. Bison was the primary food resource; deer, antelope and smaller animals such as rabbit and prairie dogs being supplemental. Frison (1978:71) adds mountain sheep to this list. Features include slab-lined roasting pits and other features common to other Northwestern Plains sites.

The extent of the northern limits and how and what relationship Benson's Butte - Beehive complex has with the sites on the open Plains to the north poses a question of considerable interest. The date of A.D. 330 at the Sly Bison site sets the initial date of Avonlea-like and the Benson's Butte - Beehive complex in the Pine Breaks. The terminal date at Benson's Butte was A.D. 1010. Consequently this Late Prehistoric Period I complex is within A.D. 300-1100.

Other cultural manifestations are evident in the area. Middle Missouri influences from the east, Great Basin to the west. These are generally defined on the basis of ceramics. However, the influences from the north in Late Prehistoric Period I are vague at best. The Avonlea manifestation is just beginning to be understood in scope and the expanding flake point tradition characteristics should aid in the definition.

## Conclusions and Suggestions

The conclusions of most archaeological reports are generally not nice tidy statements but are statements which should be addressed by further research. This thesis has suggested that:

1. There is a distinctive Late Prehistoric Period I cultural complex in southeastern Montana and the broken country of Wyoming. The Benson's Butte - Beehive complex is characterized by a distinctive adaptive strategy based on fortification, mass bison kills, a wide variation in projectile point types, and several specific tools. This complex flourished between A.D. 300 - 1100.
2. This complex and other Late Prehistoric Period complexes on the Northwestern Plains participate in a distinctive manufacturing tradition -- the expanding flake point tradition -- to make the small side-notched arrow points. The manufacturing tradition is temporally coincident with the sudden widespread use of the bow and arrow as the primary projectile delivery system. It is suggested that one of the reasons for the sudden change to region-wide use of the bow and arrow (ca. A.D. 150-300) was this more efficient point manufacturing system.



3. The roots of the Avonlea type point are in the expanding flake point tradition. Characteristic of this tradition are thin expanding ovoid flakes produced by a billet. This flake is then modified into a triangular preform and finally notched by a pressure technique.
4. The range of inter - and intra-site variation in projectile point types is generally greater for most of the Late Prehistoric period than previously thought. The types, Avonlea, Prairie and Plains side-notched as originally defined by Kehoe (1966), co-occur in many sites. Also radiocarbon dates are showing Avonlea type points to be present up until A.D. 1150. Using point typology only to establish cultural ties is not feasible. Rather Northwestern Plains projectile point types grade from low almost corner-notched styles to the wider-squared base of the late Plains types and the types overlap in time.
5. Intra - site variation is greater at some sites than others. At bison kill sites, particularly those used consistently over time, e.g, Vore, Head-Smashed-In, Gull Lake, and Estuary Pound, the range of variation is often not great for each component. It is suggested that this is related to the amount of time for preparation for a relatively certain gain. At small fortuitous kills, less planning was employed and the range of variation is expected to be greater. In other words, variation may be indirectly related to fortuitous vs. planned or scheduled incidents.

6. The Pine Breaks of southeastern Montana are an ecologically distinct area with greater resource variety than the open Plains. Limited evidence indicates winter (fall through spring) occupation. However, the general indication is that the Pine Breaks are used by most Northwestern Plains groups at least seasonally or on a scheduled basis and there is no one distinctive indigenous population. The wide distribution of porcellanite to the west and south indicate the collecting and then dispersal of the collectors.

The above statements summarize this work and stand as hypotheses to be tested by future workers.

APPENDIX A:

Illustrations of SSNA Points from:

Benson's Butte

BLM Bison Trap

Estuary Bison Pound

Garratt Site

Ramillies

Sly Bison

Wortham Shelter

The purpose of the illustrations of the SSNA points shown here is to provide examples of the various types and their associated radiocarbon dates. The illustrations show the range of variation of the types as well as indicating this variation within each level or component of the sites.

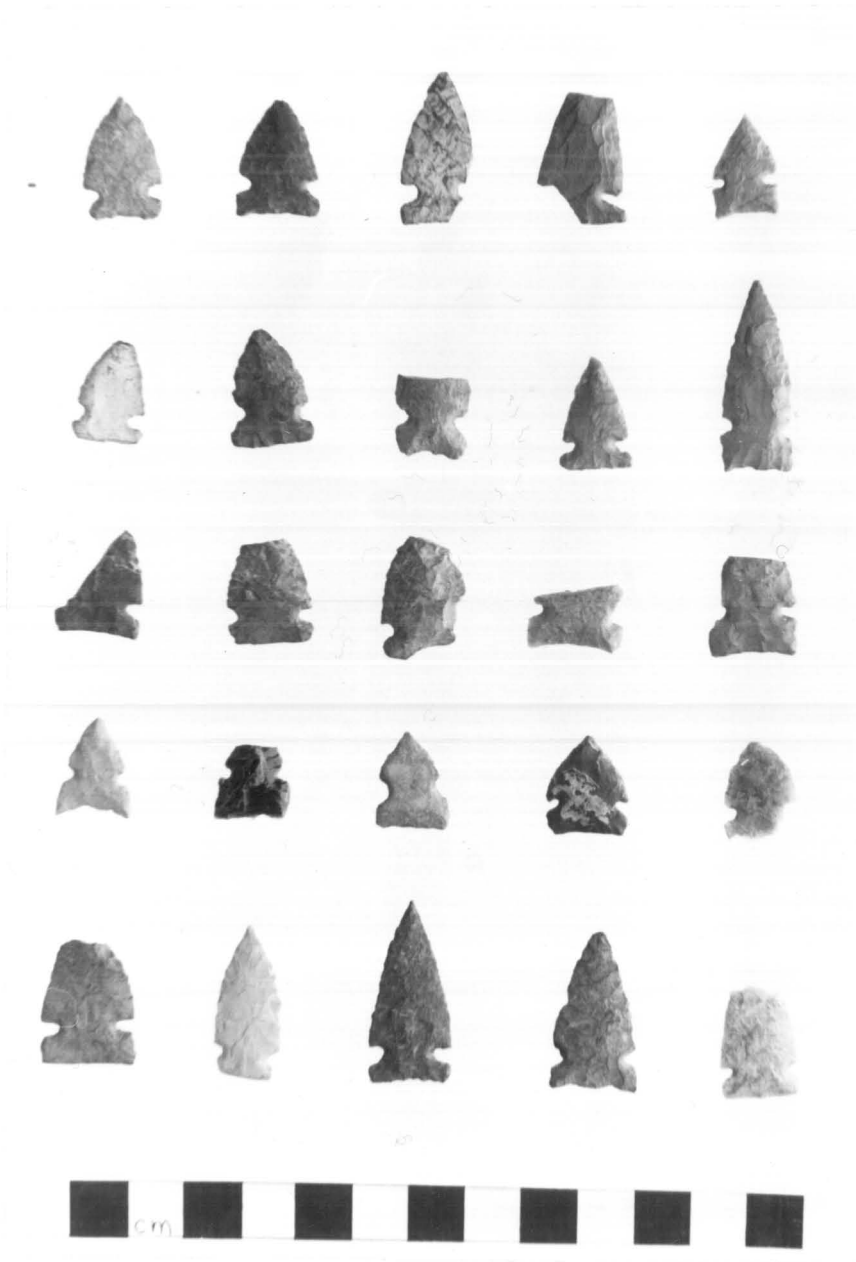
If clean photocopies could not be made the photographs were traced. Although obviously showing only the outline of the artifact the illustrations provides a basis for the discussion in the text.



(From L. Fredlund 1979:Figure 21)

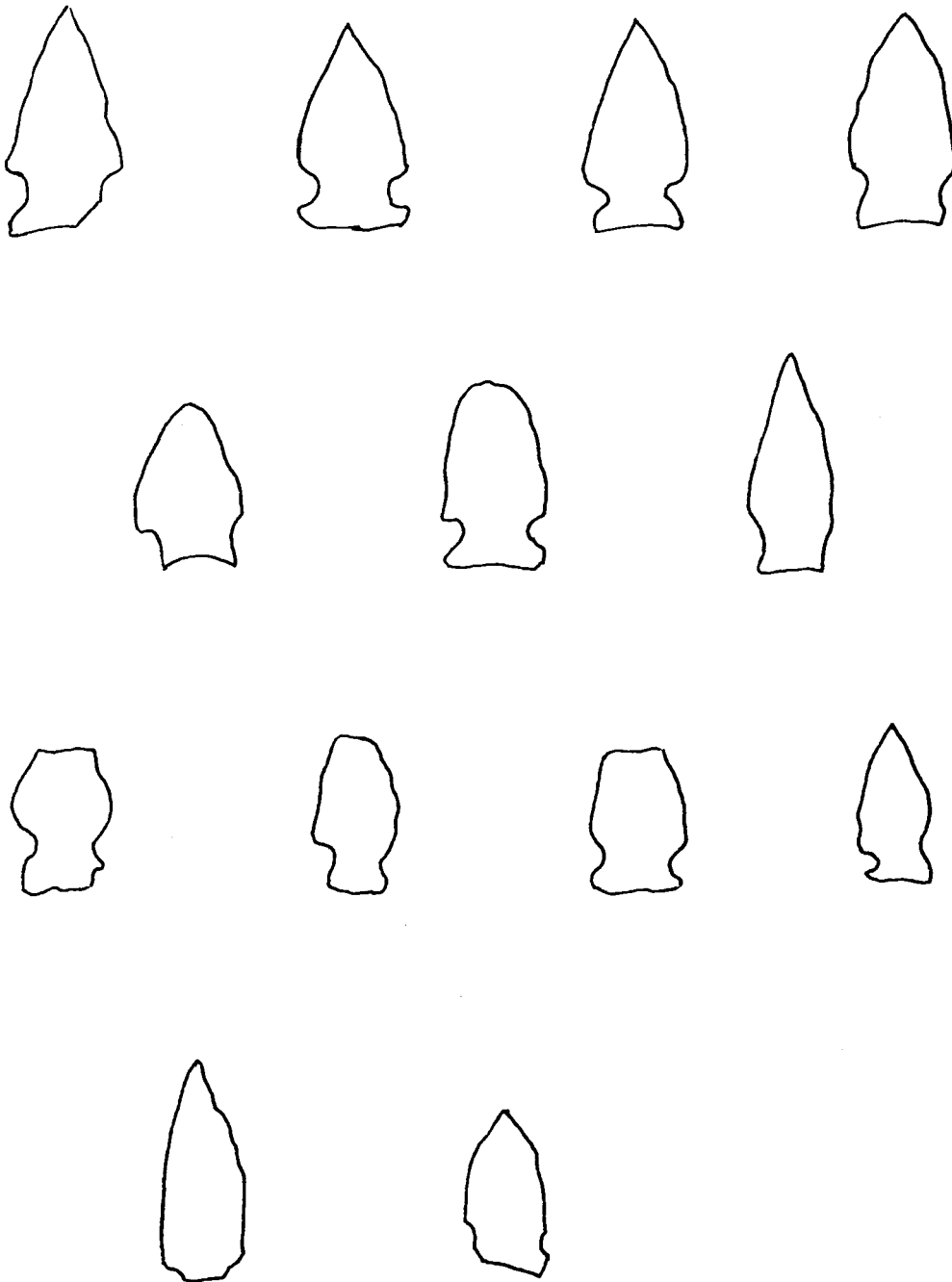
#### BENSON'S BUTTE

A butte-top occupation site in southeastern Montana is essentially unstratified and yielded large numbers of Avonlea, Avonlea-like, and Plains Side-Notched points. Radiocarbon dates on charcoal are: A.D. 770 $\pm$ 70, A.D. 840 $\pm$ 70, A.D. 900 $\pm$ 60, A.D. 780 $\pm$ 70, A.D. 700 $\pm$ 80, A.D. 1010 $\pm$ 60, A.D. 440 $\pm$ 60, A.D. 810 $\pm$ 50 and a single date from the Middle Archaic of 2280 $\pm$ 80 B.C. Although the points represent a wide variety of types it is felt that most of the activity was within several hundred years (A.D. 700-1000) based on the radiocarbon dates.



(From L. Fredlund 1979:Figure 22)

BENSON'S BUTTE

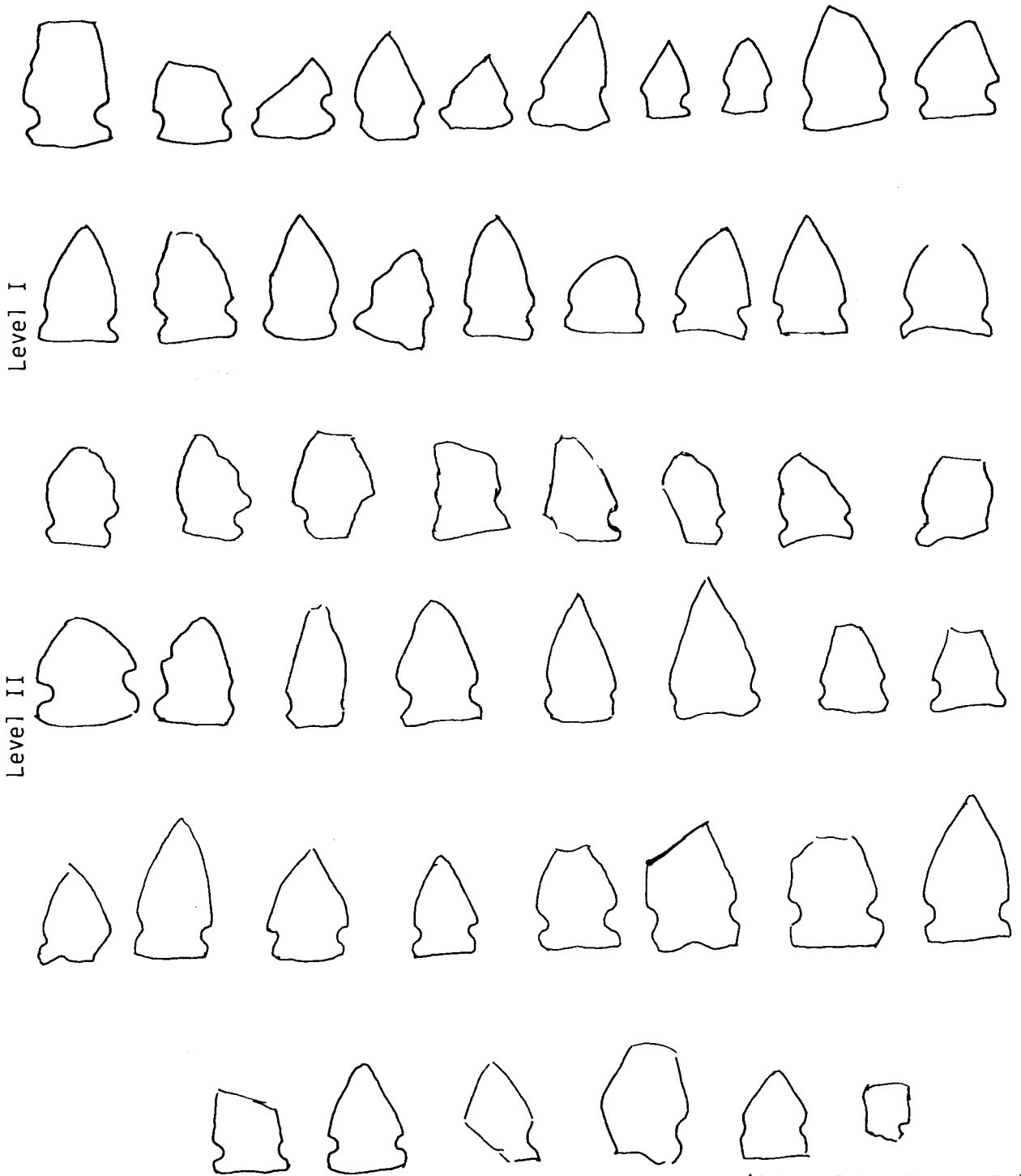


(Actual size)

(From Ekland 1974:Figure 23)

BLM BISON TRAP

Small single incident snowdrift kill in southeastern Montana.  
No radiocarbon date obtained.

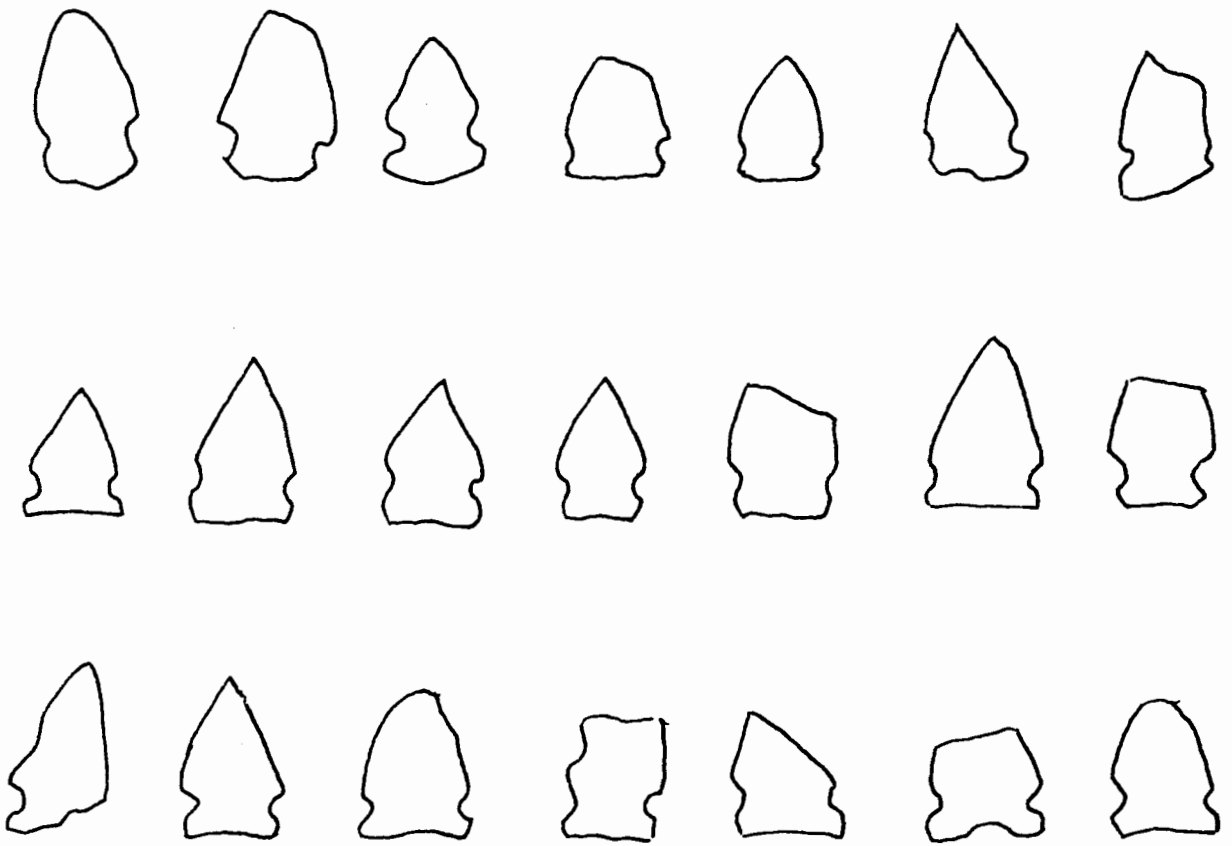


(Adams 1977:Figure 18)

Prairie Side-Notched

ESTUARY BISON POUND



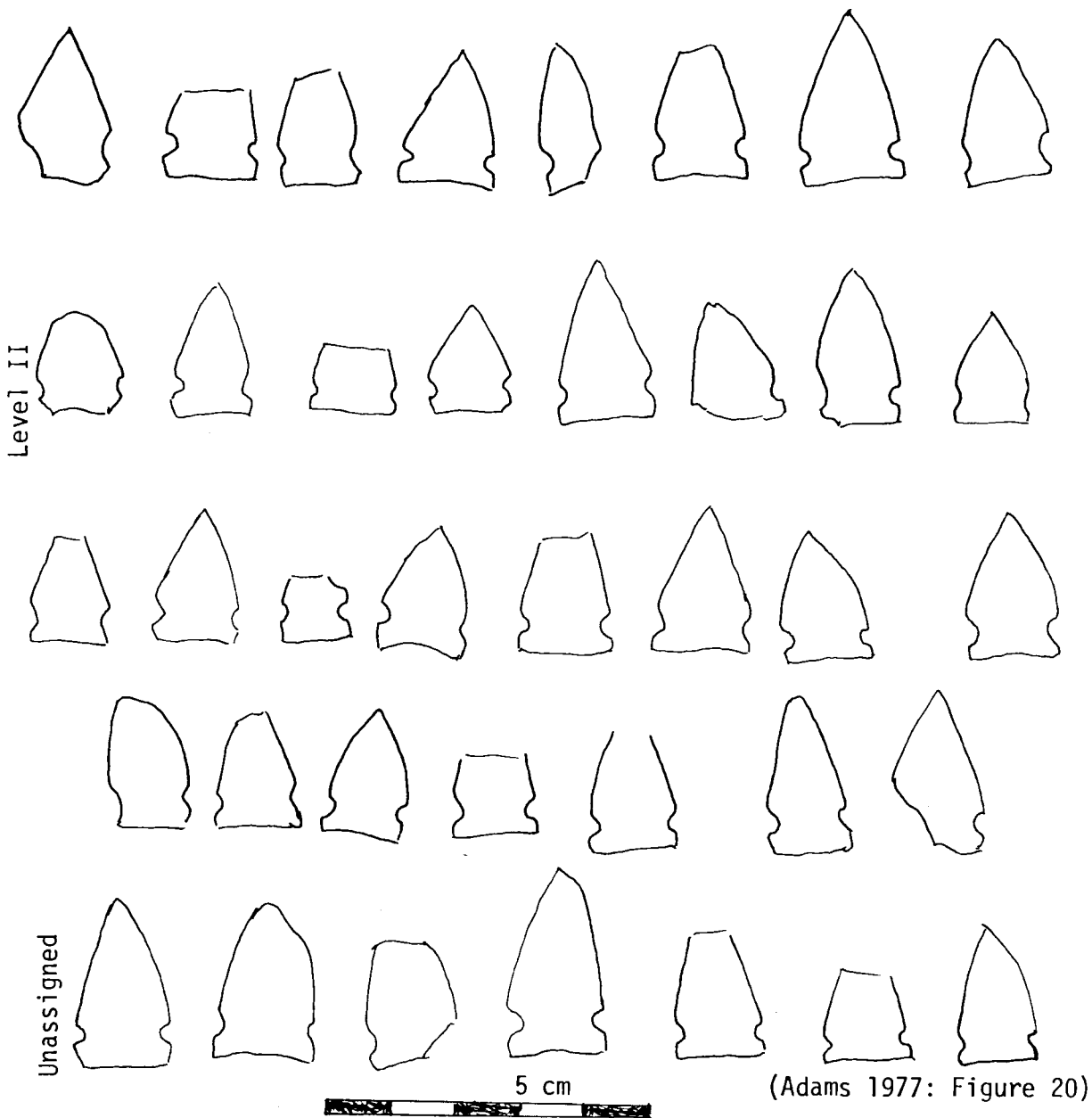


5 cm

(From Adams 1977:Figure 19)

Prairie Side-Notched  
Unassigned to any specific level.

ESTUARY BISON POUND

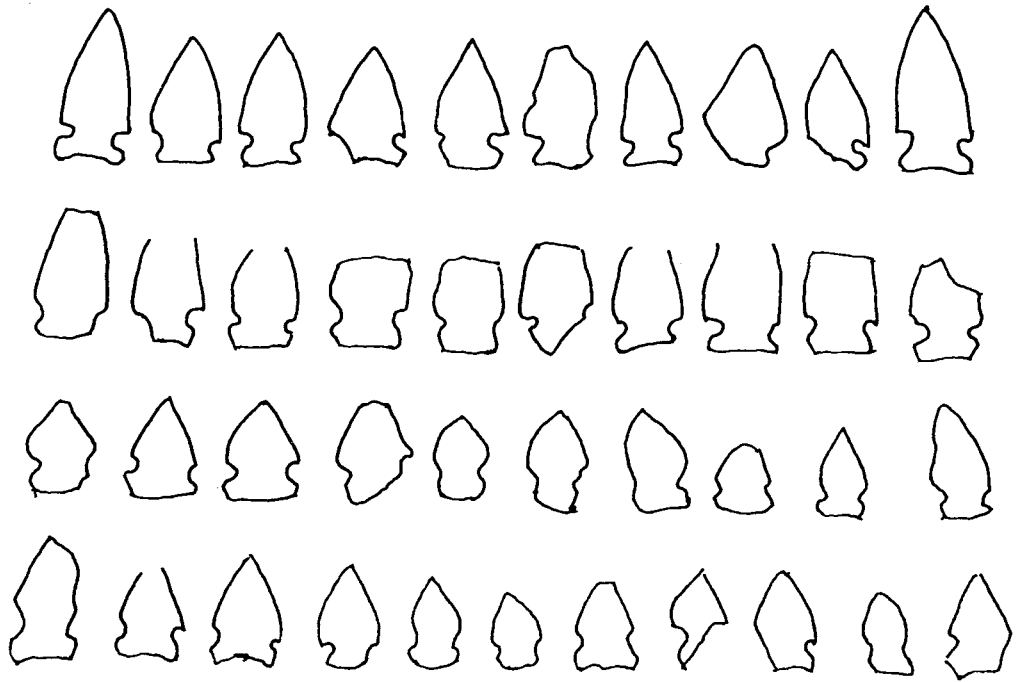


Avonlea

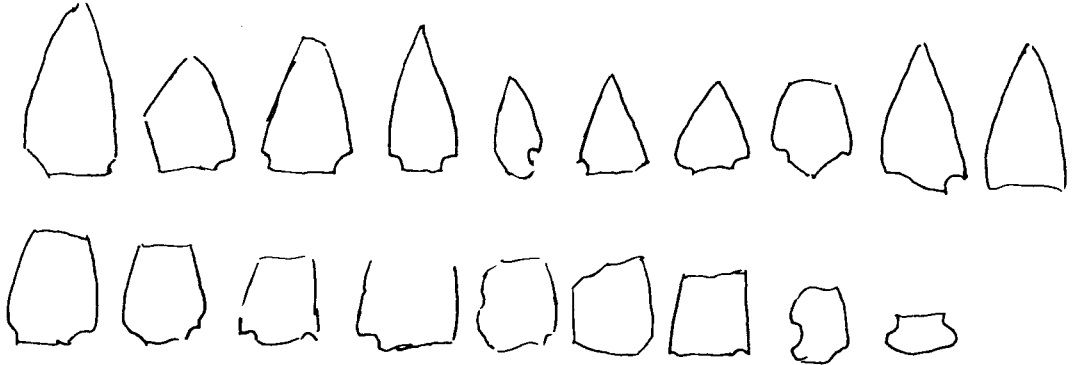
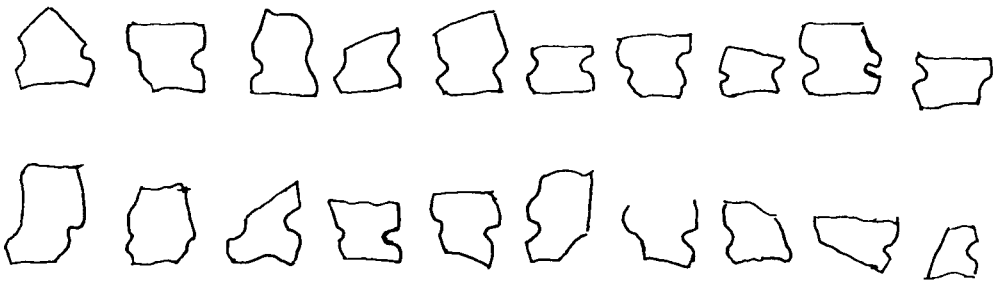
### ESTUARY KILL

The Estuary Bison Pound is located in southwestern Saskatchewan. Two levels were distinguished: Level I contained Prairie Side-Notched points, hearths and small tools. The lower level II contained Avonlea and Prairie Side-Notched points in conjunction with the bison pound.

Radiocarbon dates on Level I are 1020±80 years: A.D. 930 (GaK-3809) and 1970±70 years: A.D. 880 (S-640)  
 on Level II is 1190±165 years: A.D. 760 (S-641).



5 cm



(Munson 1980:Figures 10,11)

Prairie Side-Notched

OLD HOMESTEAD KILL SITE

Old Homestead Kill is a single component snowdrift kill in southeastern Montana. A single radiocarbon date from an associated hearth is 850±50 years: A.D. 1100 (TX-3148).

Plate 25. Avonlea



Plate 26. Avonlea Triangular



Plate 1. Plains Side-Notched and Prairie Side-Notched



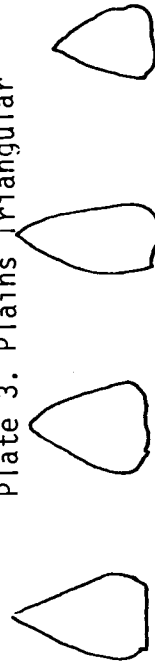
Plains



Plate 2. Prairie Side-Notched



Plate 3. Plains Triangular

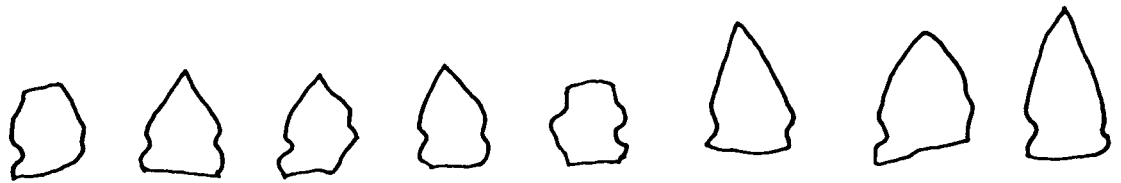


GARRATT SITE

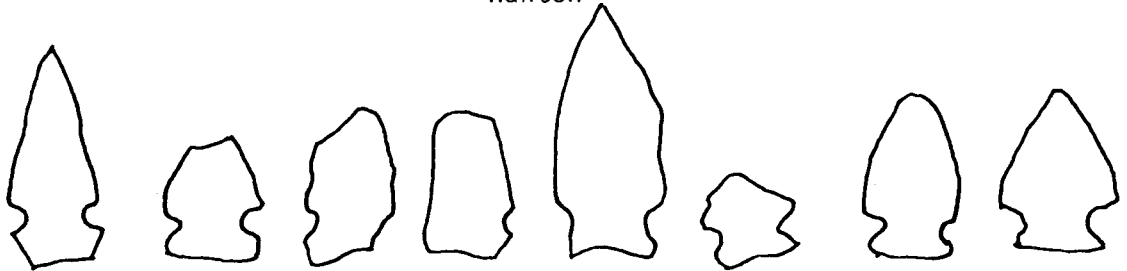
A multi-component stratified site near Moose Jaw, Saskatchewan, contains Besant, Avonlea and a later Plains-Prairie side-notched level. Ceramics were associated with all three levels. Radiocarbon dates on the Avonlea level (6) are:

- 1450±70 years: A.D. 500 (S-406)
- 2180±60 years: A.D. 670 (S-408)
- and on the Besant level:
- 1990±75 years: 40 B.C. (S-409)

Author: Grace Morgan 1973



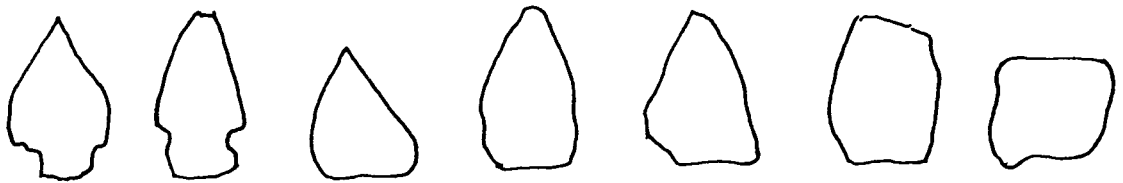
Nanton



Paskapoo

Irvine

Lewis



Not  
classi-  
fied

High  
River

Plains Triangular



Plains Triangular

Avonlea Triangular

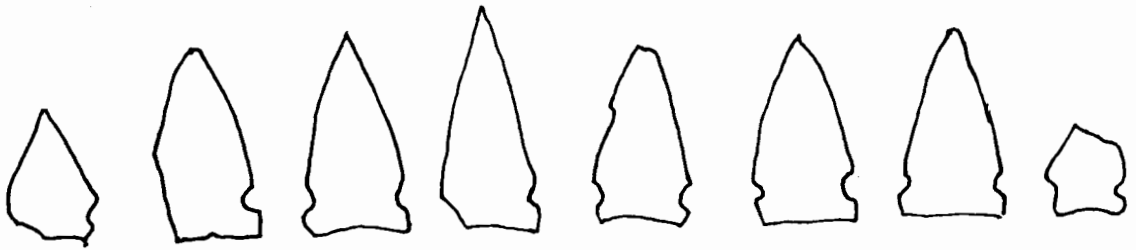
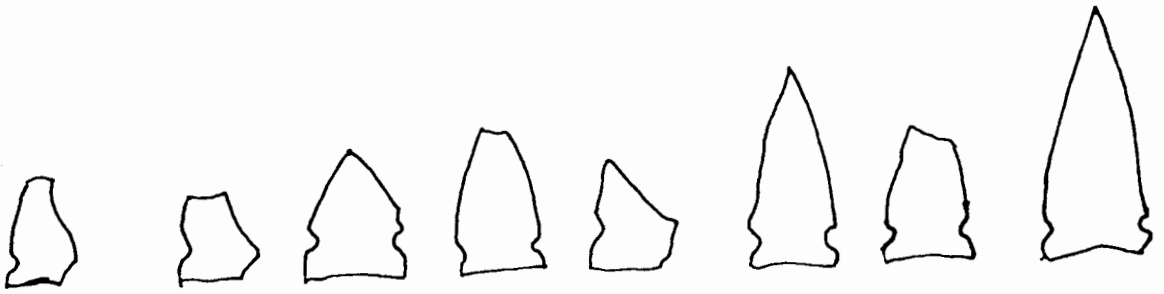
(Actual size)

(Brumley 1976: Plate 9)

### RAMILLIES SITE

A multi-use bison pound in southeastern Alberta, the Ramillies site yielded evidence of pound use until 965±65 years: A.D. 985 (S-1015) by Avonlea groups. Although levels were mixed but a second date of 660±115 years: A.D. 1290 (S-1016) is attributed to Old Womens phase materials.

Author: John Brumley 1976



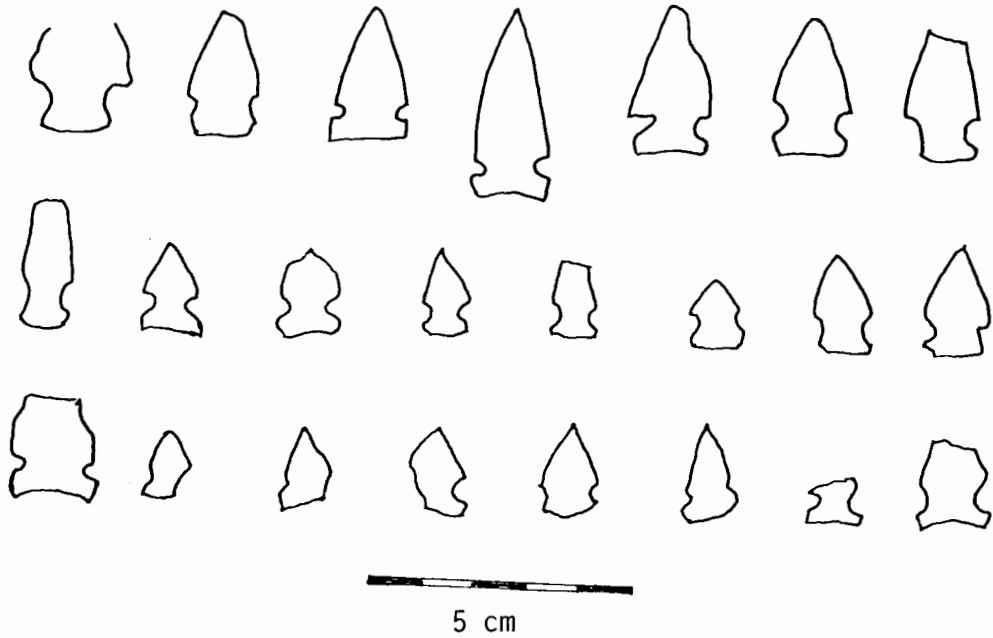
Avonlea



(Actual size)

Nanton  
203

(Brumley 1976: Plate 8)



(Steere 1980:Plate 2)

#### SLY BISON SITE

The Sly Bison site is an arroyo kill and processing area in southeastern Montana. Only the processing area has been excavated and the Avonlea-like points come from this portion of the site.

Three radiocarbon dates were obtained:

- 1620±200: A.D. 330 (TX-3782)
- 1410±50 : A.D. 540 (TX-3785)
- 1600±100: A.D. 350 (TX-3786).

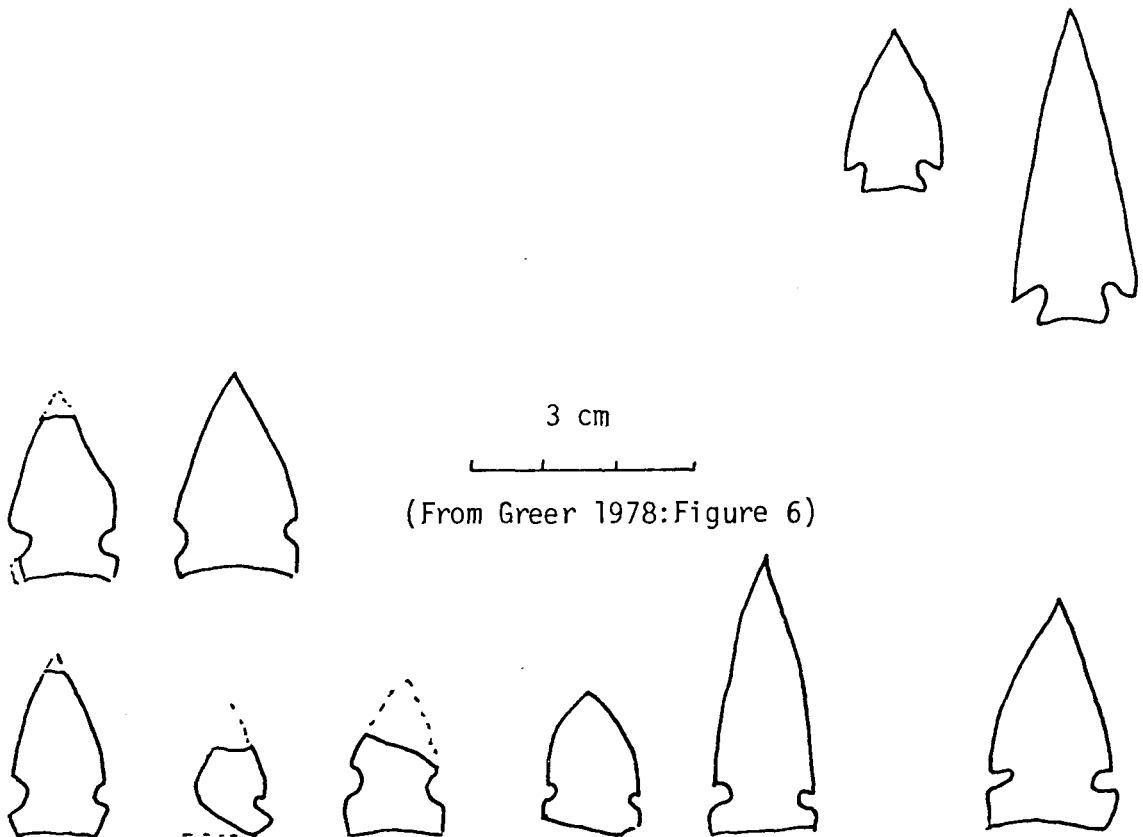
## WORTHAM SHELTER

Wortham Shelter is a "dry" cave in the Big Horn Mountains of Wyoming which contained preserved arrow shafts, associated chipped stone tools and faunal materials. The points are classified as Avonlea or, more precisely, Timber Ridge variety. Two radiocarbon dates on this single "occupation interval" are:

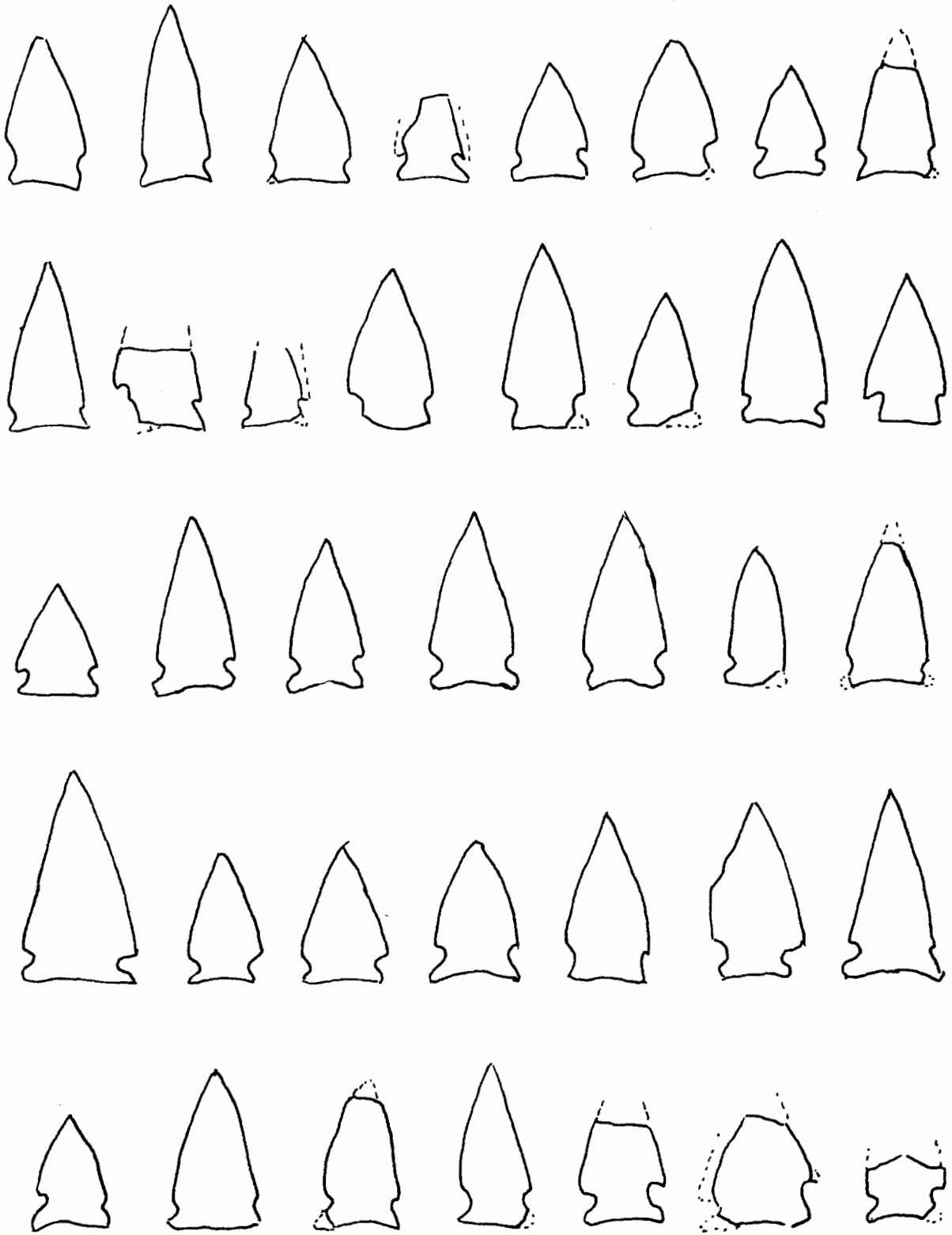
1230±90 years: A.D. 630-810 (TX-2715)

1230±57 years: A.D. 650-790 (TX-2716)

Author: John Greer 1978







(Adapted from Greer 1978:Figure 7)

3 cm



WORTHAM SHELTER

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