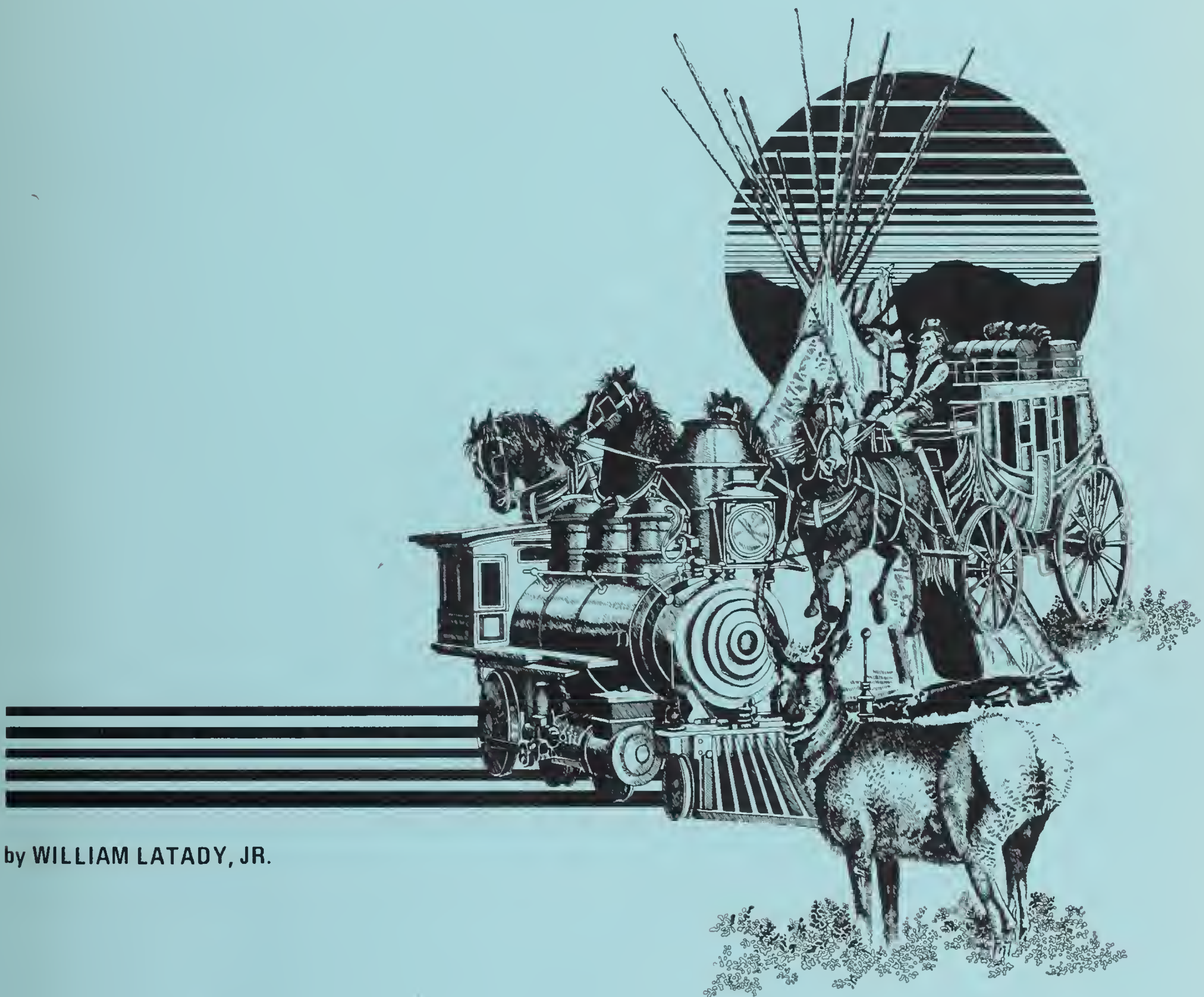
Archaeological Investigations Along SAGE CREEK ROAD Carbon County, Wyoming



by WILLIAM LATADY, JR.

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ARCHAEOLOGICAL INVESTIGATIONS ALONG SAGE CREEK ROAD CARBON COUNTY, WYOMING

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Foreword

Archaeological Investigations Along Sage Creek Road, Carbon County, Wyoming, represents the fourth in the series of continuing Wyoming Bureau of Land Management (BLM) cultural resource monographs. The report is based on a multi-stage archaeological investigation at four prehistoric sites, carried out by the office of the Wyoming State Archaeologist in the Sage Creek Basin of south-central Wyoming. The work was conducted in response to a Wyoming Highway Department road improvement and upgrading project authorized by the BLM. In addition to providing routine descriptive information that will be of general assistance to research archaeologists, this effort also offers the reader a welcome opportunity to view prehistoric adaptation in an area situated between two ecologically different zones--the High Plains and the Great Basin.

It is with pleasure that we present this volume. We believe the publication will be valued by the professional community as well as others who share our concern for protecting the full range of cultural resources on public lands. We hope you enjoy this work.

Raymond C. Leicht, Ph.D.
Series Editor

ABSTRACT

In 1982, the contracting division of the Office of the Wyoming State Archaeologist conducted archaeological investigations at four prehistoric sites, 48CR3812, 48CR3813, 48CR3814 and 48CR3815 in southcentral Wyoming. Archaeological assemblages from these sites range from the Paleoindian Period to the Late Prehistoric Period. Analysis of these assemblages permitted inferences to be made concerning aspects of the settlement and subsistence patterns of prehistoric populations in this area. Investigations at 48CR3812, 48CR3813 and 48CR3814 were confined to surface recording only. The Sage Creek site, 48CR3815, provided most of the information on which the interpretations were based. This site, a stratified multicomponent site, was occupied on a number of occasions between 9,000 and 1,200 years ago.

ACKNOWLEDGEMENTS

A number of persons contributed their help and expertise during various stages of this project. Nina Trapp, Divide Resource Area Archaeologist, initiated the archaeological investigations and provided the senior author with suggestions and encouragement. Funding was provided by the Wyoming Highway Department. Harry Underwood is thanked for help with this funding.

Jeff Hauff and the author served as field supervisors. Field crew members, in alphabetical order, included: Lucy Chronic, Terry Fisher, Paul Hokenstad, Tom Lessard, Kathy Mahan, Judy Michaelsen, Carl Spath, Steve Sutter, Sandra Todd, Jim Truesdale, Brian Waitkus and Renee Wuertley. Tim Christiansen and John Wells volunteered their help for several days.

Laboratory and office personnel included: Lucy Chronic, Kathy Jenne, Lavonne Metzler, Linda Peyton, Jim Truesdale and Pat Ward. The computer mapping programs were originally written by Lucy Chronic. Linda Peyton revised them to suit the needs of this project. Jim Truesdale and Linda Peyton entered the coded data into the University of Wyoming Cyber Computer. Lavonne Metzler and Pat Ward typed several drafts of this report. Marlene Ware did the final revisions.

The writers benefitted from discussions and comments by Bill Fawcett, Julie Francis, George Frison, Eric Ingbar, Marcel Kornfeld and Jeanne Moe. Any errors contained in this manuscript are the responsibility of the senior author.

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CHAPTER 1
INTRODUCTION
William R. Latady, Jr.

This is a report of archaeological investigations conducted for the Wyoming Highway Department on a road improvement project in south-central Wyoming. This project was conducted in three stages. The initial stage consisted of a complete surface inventory of 16 km (10 mi) of the proposed road realignment right-of-way. The results of this survey and recommendations for additional investigations appeared in an earlier report (Trapp 1982). Briefly, four archaeological sites and six isolated finds were recorded. All four sites, 48CR3812, 48CR3813, 48CR3814 and 48CR3815, appeared to be potentially significant and required further work in order to comply with state and federal guidelines on cultural resources.

The second stage consisted of fully recording each of the four sites. This included artifact mapping and collection, as well as testing. This work was intended to assess the significance of each site, determine the impact construction would have, and, if necessary, formulate a plan to mitigate the loss of information from these sites.

The final stage of the project consisted of mitigation of portions of the Sage Creek Site, 48CR3815. Excavations revealed the presence of 5 buried cultural levels ranging in age from the Paleoindian to the Late Prehistoric Period.

Although the work outlined above complies with the legal authority for the project, of greater importance is the scientific information to be gained. In recent years, energy development in Wyoming has contributed to a huge increase in Cultural Resource Management archaeology. This work has resulted in recording thousands of previously unknown sites. These sites, though rarely more than surface manifestations, indicate that Wyoming has been inhabited by hunters and gatherers since the terminal Pleistocene.

The study of hunters and gatherers has long been an important component of archaeological investigations. Wyoming, with its long history of hunting and gathering cultures, is ideally suited for these types of studies.

The location of the sites described here provides an opportunity to view adaptation in an area situated between two ecologically different areas. The High Plains to the north have been considered an area where human groups specialized in big game hunting (Frison 1978; Reher and Frison 1980). To the west is the Great Basin, where a reliance on plants rather than big game is suggested by the ethnographic record (Steward 1938). The presence of these sites in the Sage Creek Basin encourages research on local versus regional adaptations, thus increasing their inherent value.

In the following report, the authors have attempted to describe the work, present the information, and then interpret this information. Due to the constraints inherent in Cultural Resource Management studies, any interpretations offered at this time should be considered preliminary. A good deal of information is still available at two of these sites and it is hoped that further excavations will provide data which can be applied to the questions raised here.

CHAPTER 2
RESEARCH ORIENTATION

William R. Latady, Jr. and David G. Eckles

The research perspective of this report is based on a model of subsistence and settlement behavior of hunter-gatherers employed by Reher (1979:11-14) for the Northwestern Plains. Although applied in the western Powder River Basin, it was originally utilized in the southwestern United States and has been applied worldwide. Essentially, it is a predictive model which views site locations as attempts to maximize energy acquisition while minimizing energy expenditure (Plog and Hill 1971:12; Judge 1971:38; Hill 1971:58). This approach assumes that human behavior is patterned, not random, and therefore, the distribution of energy resources in an environment constrains the organization and distribution of cultural behavior (Reher 1979:139).

Three additional assumptions were made in applying this model to southcentral Wyoming. First, the archaeological record of the Sage Creek Basin reflects the technology used by the prehistoric inhabitants to cope with the physical environment. Second, site types are delineated in terms of technology and energy extractive activities carried out at these respective areas. Once defined, it should be possible to examine the spatial distribution of these types in relation to potential food and other economic resources. Finally, given the above assumptions, the possibility exists for making inferences concerning the settlement system.

Research Design

Archaeologists have three primary concerns: the explanation of culture history, the reconstruction of past lifeways and the study of culture process (Thomas 1979). Data applicable to these concerns are continually accumulating. However, how these concerns are addressed is up to the individual researcher. The discussion in this section centers around three problem areas. These are chronological studies, settlement patterns and subsistence patterns.

Chronological Studies

The temporal placement of archaeological sites assumes an important function when examining questions concerning settlement and subsistence patterns. A chronology is based upon changes in archaeological assemblages as observed in dateable sites found within an area of limited environmental and cultural diversity. Interassemblage variation through time is thought to be the by-product of cultural adaptation. The study of these changes ties together the stated arms of archaeology.

For instance, the temporal framework employed for the Sage Creek Basin is based upon a chronology developed for the Northwestern Plains. Because this chronology is borrowed from an area where environmental conditions may have been different, there is a good deal of uncertainty in applying it to this area.

Geological studies undertaken at one site, 48CR3815, addressed this problem to some extent (see Appendix 1). Using the stratigraphic principle of superposition, the general sequence of deposition was defined. This provided relative dating of the observed cultural levels and permitted inferences concerning the depositional environment at the time of occupation. These include the flora, fauna and climate of the local environment. Paleoclimatic information gained through analysis of dated sites can be used to reconstruct a scenario of climatic change for a region (e.g. Benedict 1981). Regional climatic reconstructions are important in studying hunter-gatherer adaptations through time.

The geological assumptions upon which this part of the research orientation are based include: 1) alluvial and eolian deposition occur in response to climatic and geological processes; 2) present landforms, vegetation, and soil development are the result of these processes through time; and, 3) these processes affected human use of the area and the preservation of the archeological record.

Extensive subsurface investigations were only conducted at one site, 48CR3815. Therefore, any climatic interpretation for the project should be considered tentative. Any future investigations are expected to contribute data which may be used to examine the patterns observed and recorded at this site.

Settlement Patterns

In order to interpret settlement patterns it is essential that site function be determined. Once this has been ascertained, then how the site fits into the seasonal round can be determined.

Ethnoarchaeological studies have shown that how places are used within a settlement system reflects the adaptive strategies of the inhabitants (Yellen 1977; Binford 1978, 1983). Ideally, the manner in which sites occur on the landscape as well as how space within a site was used, how often, for what reasons and how its use changed through time need to be studied. This information can then be used to develop a settlement model for an area.

For example, studies of the ethnographic use of fire and the relationship between hearths and overall site structure have been conducted in other parts of the world (Yellen 1977; Binford 1983). These studies have found that hearths are an important part of the daily lives of hunters and gatherers and affect the manner in which archaeological materials are deposited. Binford (1983) notes that among the Nunamiut a number of activities occurred near hearths and, therefore, locations of specific work areas can be delineated. Chapman (1980:104-144) argues that minimum spacing requirements exist between firepits. He suggests that sites being occupied by a food sharing group would exhibit minimum spacing between hearths due to social and physical requirements. In sites which have been reoccupied, spacing may be less because of new hearth construction in overlapping living areas. Using this information, it should be possible to examine the distribution of fire-affected rock and features at sites to gain information about site use (McDowell-Loudan 1983). Studies of the distribution of features and fire-affected rocks in archaeological sites have been related to ethnographic models of site structure and reoccupation (Yellen 1977; Vehik 1977).

A systematic examination of variation in artifactual assemblages can indicate the types of activities carried out in given areas, as well as reuse and reoccupation of different areas. Studies of the distribution of raw material flake and tool types within site boundaries have been employed to examine possible site use (Moe et al. 1983). A clustered distribution of distinctive raw materials, particularly those which do not occur locally, may indicate particular activities such as tool maintenance or manufacture. A separate occupation by a small group of people may be indicated by a cluster of diverse tools.

Artifact and raw material distribution at 48CR3815, 48CR3814 and 48CR3812 were studied in an attempt to define internal structure including activity areas and evidence of reuse. This data was then combined with information on artifact assemblage composition and compared with studies from two other areas in Wyoming.

Francis (1984) has argued that differences in intersite variation exist between the Powder River and Washakie Basins. Analysis of artifact assemblages from sites in both areas indicate that archaeological sites in the Powder River Basin separated out into fairly discrete groups of small and large habitation sites and several types of limited activity sites. In contrast, site types in the Washakie Basin cannot be as clearly defined. Following Binford's (1980) characterization of foragers and collectors, Francis suggests that the observed differences are due to organizationally different hunting and gathering strategies within these two areas. In the Powder River Basin data seem to indicate that subsistence was oriented toward a logistically oriented collecting and specialized bison hunting strategy. Sites in the Washakie Basin more closely confirm to expectations for foraging strategies organized around exploitation of a variety of resources in a cool desert environment.

Two models were derived to account for the differences. First, hunting and gathering strategies range from broad spectrum foraging to specialized hunting (Reher 1979). These strategies will change through time as environmental and demographic conditions change. The second model proposes that although differences in hunting and gathering strategies do exist, they are largely the result of seasonal availability of resources.

Data from the Sage Creek investigations provide a very limited sample of site types in the Sage Creek Basin. For comparative purposes, artifacts from another 26 sites from the basin were analyzed. The information from these sites was made available by the Wyoming State Historic Preservation Office.

Subsistence Patterns

The small sample of sites examined here was not expected to provide information on the full range of subsistence activities within an adaptive system. However, each site was expected to provide information on some of the resources used at a particular locality.

Subsistence patterns can be addressed through the study of both faunal and floral remains preserved in the archaeological record.

Faunal remains can provide information on a variety of resource procurement patterns, storage and use of meat, bone and other animal products. Unfortunately plant remains are more difficult to detect and often do not reflect the full range of use. Recent studies in Wyoming and Montana have shown that an edible plant resource base can be inferred from existing plant resources observed within the site setting (Marlow 1979, 1984; Latady 1982b; Latady and Dueholm 1985; Aaberg 1983). Unfortunately, due to time constraints, survey of the modern vegetation only occurred at 48CR3815. However, macrofloral remains were examined through analysis of hearth contents recovered from each site. Although this approach is limited for interpretive purposes due to cultural and post-depositional processes, the presence of preserved plant taxa can indicate similarities or differences between the present environment and that existing when the site was occupied. In addition, possible seasonality of site use can be postulated through examination of preserved macrofloral remains in the hearth contents.

CHAPTER 3
ENVIRONMENTAL AND CULTURAL SETTING

Brian Waitkus and William R. Latady, Jr.

This chapter presents background information about the general environment and cultural chronology of the project area. This information provides a foundation for interpreting the results of the investigations contained in this report.

Environmental Setting

The project area is located within the Sage Creek Basin, one of the geomorphic units comprising the Wyoming Basin (Figure 3.1). The physiography of this region is variable, but can be described as a sagebrush dominated grassland within which is found isolated uplifts, river valleys and badlands.

Geology, Topography and Hydrology

The remnants of the oldest known mountain building activity in the region occur as outcrops of Precambrian age granites and metamorphic rock in the Sage Creek Basin (McGrew *et al.* 1974:2). Superimposed over this remnant are Cambrian through lower Cretaceous aged (Paleozoic to lower Mesozoic era) materials consisting of sandstones, conglomerates, limestones, dolomites and anhydrites. The Upper Cretaceous outcrops include the Frontier formation of sandstone and shales, the Steele shale, and the Mesaverde formation of sandstone (McGrew *et al.* 1974).

Beginning at the end of the Mesozoic Era and continuing into the early Cenozoic Era, the Laramide Orogeny created the present mountain and basin geography. This deformation created the Kindt Syncline and Atlantic Rim which have greatly influenced the surface geomorphology surrounding the Sage Creek Basin. Also, at this time, the climate became drier (McGrew *et al.* 1974).

The Miocene Formations, called the Northpark and Ankaree, developed from erosional activity initiated during the end of the Cretaceous and beginning of the Tertiary periods. This activity consolidated sediments of conglomerates, sandstones, shales and volcanics in the lower areas (McGrew *et al.* 1974).

The uplifting noted above eventually created rejuvenated streams, dissecting and eroding the area. Once through a portion of the Mesaverde Formation, rapid downcutting proceeded into the Steele shale, Niobrara and Frontier Formations, which comprise most of the Sage Creek drainage basin. The escarpment to the north and Atlantic Rim are comprised of the more resistant Mesaverde formation (McGrew *et al.* 1974).

Continued erosion of the Eocene deposits has exposed the remnants of the Lower Cretaceous to Cambrian levels, while higher up the Precambrian bedrock is exposed in the Sierra Madre uplift. At present, the volume and erosive power of the streams is greatly reduced. This

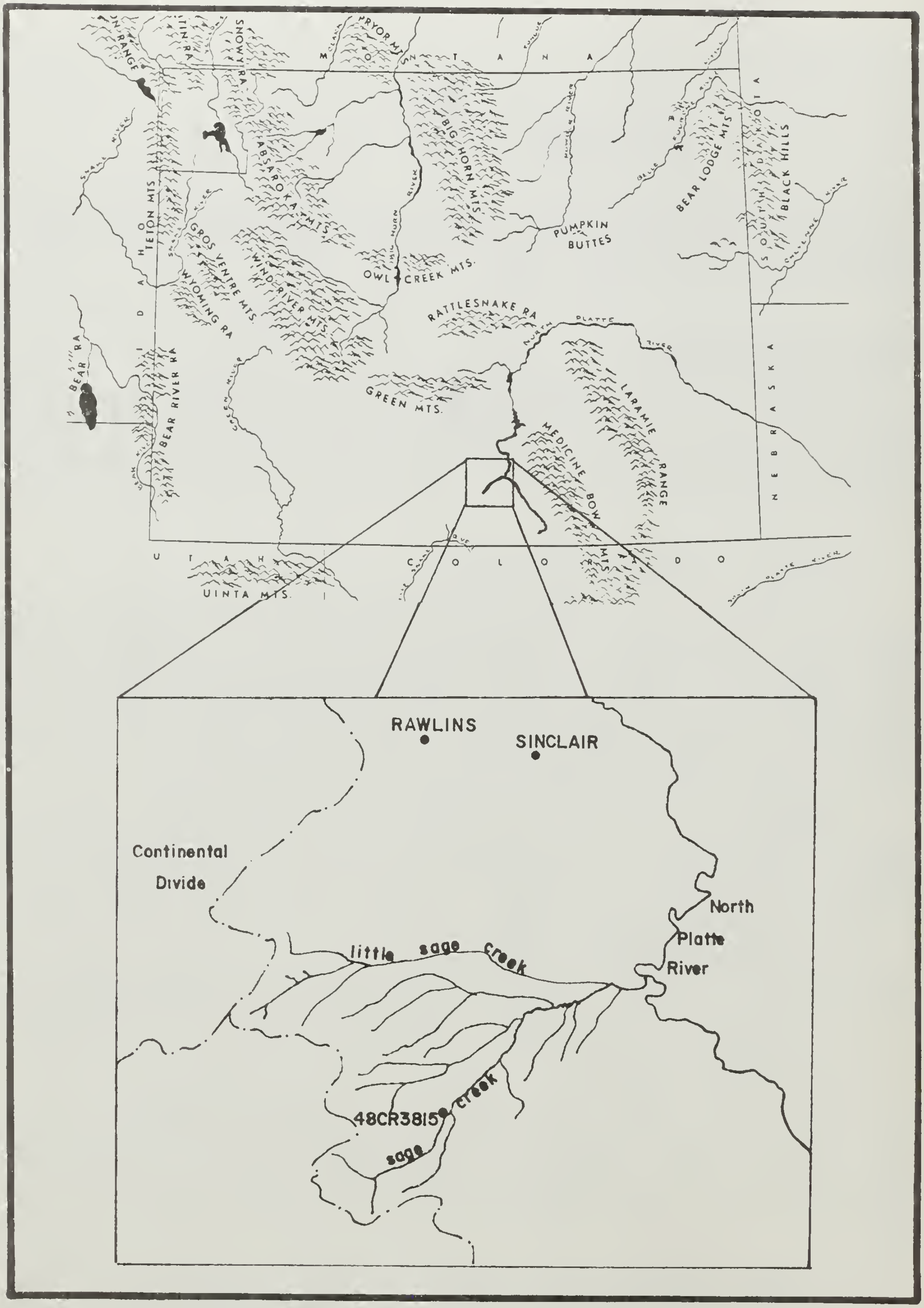

Figure 3.1. The Sage Creek Basin.

loss of erosive power is attributed to the retreat and disappearance of the Pleistocene mountain glaciers and low rainfall. Today, a number of streams flow east into the North Platte River. Drainage is controlled by the faulting and structural elements existing in the Upper Cretaceous sediments (Del Mauro 1953).

Big and Little Sage, Pine Grove, Rasmussen and Miller Creeks all have a year round supply of water. Big Sage Creek is the major stream, receiving its water from several tributaries before flowing into the North Platte River. The remaining creeks are intermittent and carry surface water near their heads, but this water usually seeps into the permeable sands of the basin floor within 3.2-4.8 km (2-3 mi). Much of this water is from the winter snows that accumulate along the flank of Miller Hill (Del Mauro 1953:17-18). Rainstorms are the only other water source for these drainages.

Climate

The project area is located within an intermountain desert steppe region which is characterized by great seasonal variability between winter and summer months. Summers are generally mild and winters cold. Temperatures range from an average maximum of 28.8°C (84°F) in July to -11°C (12°F) in January (Department of the Interior 1978:R2-2). Most of the precipitation occurs between April and September. Annual precipitation averages about 30 cm (12") and drought can be expected one year in nine. Winters are drier, and when precipitation does occur, it is usually in the form of snow. Snowfall averages between 101 cm (40") and 127 cm (50") a year (Becker and Alyea 1964) and blizzard conditions often occur when high winds accompany the snow.

Vegetation

Portions of the basin support sagebrush dominated grasslands in coarse upland soils. Meadow and small riparian broadleaf communities are found on the fine textured alluvial soils along the streams. Fine textured alkaline soils in poorly drained depressions support greasewood and saltbush. Within the Sage Creek Basin, interaction of flora with the local environment has produced seven vegetation zones (Department of the Interior 1978). These seven include: 1) grassland; 2) sagebrush; 3) mountain shrub; 4) aspen; 5) saltbush; 6) cropland; and, 7) riparian broadleaf (Department of the Interior 1978). However, within 48CR3815 only five of these vegetation zones can be identified. These vegetation zones recorded at 48CR3815 may be found in Table 3.1.

In order to get an idea of the plant taxa present in the Sage Creek Basin, the floral communities within a radius of 1 km (0.6 mi) of 48CR3815 were sampled. This site was chosen because of the communities observed also occur at the other sites.

There are five vegetation communities in the site area today. These communities are a mixed desert shrub, greasewood-bluegrass, greasewood-sagebrush, sagebrush-wheatgrass and riparian. Table 3.1 contains a list of the taxa noted at this site.

Table 3.1. Modern vegetation recorded at 48CR3815.

MIXED DESERT SHRUB

Sitanion hystrix
Alyssum desertorum
Arabis sp.
Erigeron pumilus
+ *Opuntia polyacantha*
+ *Artemisia tridentata*
Atriplex sp.
Grayia spinosa
+ *Symphoricarpos occidentalis*

GREASEWOOD-BLUEGRASS COMMUNITY

Poa sandbergii
Sitanion hystrix
Comandra umbellata
Machaeranthera canescens
+ *Opuntia polyacantha*
+ *Artemisia tridentata*
+ *Atriplex* sp.
Sarcobatus vermiculatus

GREASEWOOD-SAGEBRUSH COMMUNITY

+ *Agropyron spicatum*
Poa sandbergii
Sitanion hystrix
Alyssum desertorum
Arabis sp.
Equisetum sp.
Halogetum glomeratus
Haplopappus acaulis
Lepidium sp.
+ *Opuntia polyacantha*
+ *Artemisia tridentata*
+ *Atriplex* sp.
Sarcobatus vermiculatus

SAGEBRUSH-WHEATGRASS COMMUNITY

+ *Agropyron smithii*
+ *Elymus cinereus*
Hordeum jubatum
Poa sandbergii
Stipa comata
Achillea millefolium
+ *Allium textile*
Arabis sp.
Cirsium arvense

SAGEBRUSH-WHEATGRASS COMMUNITY (continued)
+ *Cymopterus montanus*
Machaeranthera canescens
Oenothera sp.
Penstemon caespitosus
Stanleya pinnata
+ *Artemisia tridentata*
Purshia tridentata

RIPARIAN

+ *Agropyron* spp.
Carex spp.
Juncus balticus
Poa pratensis
+ *Typha latifolia*
Salix spp.

+ = edible

Well drained sandy sediments on the hilltops support a mixed desert shrub community. Dominant plants noted include big sagebrush (Artemisia tridentata), spiny hopsage (Grayia spinosa), plains pricklypear (Opuntia polyacantha), and bottlebrush squirreltail (Sitanion hystrix). The sloping ridge sides are covered with a black greasewood-big sagebrush community. Taxa recorded include black greasewood (Sarcobatus vermiculatus), big sagebrush, phlox (Phlox sp.), bluegrass (Poa sp.) and wheatgrass (Agropyron sp.). Ephemeral drainages support a sagebrush-wheatgrass community. Big sagebrush is the dominant shrub, but antelope bitterbrush (Purshia tridentata) also occurs. Other plants noted include western snowberry (Symphoricarpos occidentalis), mat penstemon (Penstemon caespitosus), evening primrose (Oenothera sp.), basin wildrye (Elymus cinerus), wheatgrass and sandberg bluegrass (Poa secunda). Less well drained soils on alluvial terraces support a black greasewood-bluegrass community. The dominant species is black greasewood, but saltbush (Atriplex sp.) also occurs. The understory is dominated by sandberg bluegrass and foxtail barley (Hordeum jubatum). Other taxa noted include plains pricklypear and bastard toadflax (Comandra umbellata). A riparian community is formed on the moist alluvial soils along Sage Creek. Willow (Salix sp.) dominates the overstory, but cattails (Typha latifolia) occasionally occur in marsh areas. Other plants noted include wheatgrass and baltic rush (Juncus balticus).

Within these five plant communities, nine edible plants were found. All of these plants were utilized to some extent by prehistoric populations (Harrington 1967; Rogers 1980; Yanovsky 1936; Steward 1938; Grinnell 1972). The presence of certain edible plants is thought to have influenced prehistoric settlement to some degree (Reher 1983; Aaberg 1983; Latady 1982). It is not possible to determine the total number of edible plants growing within the communities at 48CR3815, because the areal extent of each community is not known. The average densities do not appear particularly high when compared with studies in other parts of the state (cf. Marlow 1979, 1984; Latady 1982; Moe et al. 1983; Latady and Dueholm 1985). It is not known whether the plants occur in sufficient quantities to be harvested efficiently.

Fauna

A variety of animals adapted to the shortgrass plains can be found within the Basin. The most common big game animal in the area today is the pronghorn antelope (Antilocapra americana). This animal was probably an important resource for the prehistoric inhabitants of this area. Although no antelope kill or processing sites have been recorded within the Basin, a number of sites containing butchered bone have been reported from southern Wyoming (Frison 1971; Zier 1982; Reiss and Walker 1982).

The other extant large game animal is the Mule Deer (Odocoileus hemionus). Ethnographic sources (Lowie 1924; Steward 1938; Grinnell 1972) discuss the use of mule deer as well as many other mammalian species.

Although not present in the project area now, small numbers of Bison (Bison bison) probably inhabited the area prior to 1850 (Seton

1937; Roe 1951). Scattered archaeological remains of bison have been found at the Finley Site (Moss et al. 1951) and at the Wardell Site (Frison 1973).

Small animals which inhabit the Sage Creek Basin include cottontail (Sylvilagus spp.), jackrabbit (Lepus spp.), Richardson's ground squirrel (Spermophilus richardsonis), prairie dog (Cynomys sp.), packrat (Neotomia sp.), deer mouse (Peromiscus sp.), skunk (Mephitus mephitus) and pocket gopher (Thonomys talpoides). Carnivores are also present and include badger (Taxidea taxus), coyote (Canis latrans) and red fox (Vulpes vulpes) (Long 1965).

Numerous species of birds including sage grouse (Centrocercus urophasianus) and magpie (Pica pica), are found in the Basin. Insects are also common as well as certain species of reptiles. Steward (1938) notes the use of sage grouse, mormon crickets (Anabrus simplex) and various reptiles by Great Basin Shoshonian groups.

Cultural Overview

The purpose of this section is to present a brief overview of archaeological background information and cultural chronology. Cultural chronologies worked out for the Northwestern Plains by Mulloy (1958) and refined by Frison (1978) continue to be applied to the Wyoming Basin. Cultural stages defined for the Northwestern Plains appear to be applicable to the Basin, but technology and subsistence strategies employed in the Great Basin culture area are expected to have influenced prehistoric adaptation in Southcentral Wyoming to some extent.

The account presented here is largely a summary of works by Mulloy (1958) and Frison (1978). Readers interested in a more detailed treatment of this subject are referred to the works by these authors. Some of the more important aspects of each prehistoric cultural period including technology and modes of subsistence are discussed in this section. Individual sites which are considered characteristic local manifestations of particular time periods are discussed.

Occupation of the Sage Creek Basin was probably sporadic during the last 12,000 years. Surface finds of diagnostic artifacts, primarily projectile points, indicate use of the area by aboriginal and Euro-American groups from the Paleoindian period through historic times (Jackson and Chastain 1976). Much of the cultural material found on the ground surface appears to have been deposited during the Late Archaic and Late Prehistoric periods. While this area may have been more intensively occupied during the last 3,000 years, the observation might also be due to a non-representative sample. A review of the Wyoming State Historic Preservation Office site files revealed that less than 1% of the Sage Creek Basin has been surveyed. Other possibilities which could contribute to a biased view of the prehistoric occupation include problems of site preservation and visibility, as well as artifact collection by non-professionals.

Paleoindian Period (12,000-8,000 B.P.)

The climate during this time interval is thought to have been somewhat cooler and more moist than at present (Antevs 1955:326-327).

Presumably, range conditions were suitable for supporting large migratory herbivores which were hunted periodically by human populations. Subsistence at other times was probably oriented toward exploitation of a variety of vegetable and faunal remains.

Evidence for Clovis occupation (11,200-10,600 B.P.) has not been found in the Sage Creek Basin. One Folsom point (10,800-10,400 B.P.) has been reported (Jackson and Chastain 1976:30), but occurred as a surface find. Buried early Paleoindian sites have not been recorded.

Two Folsom sites have been reported further west. The Mud Springs site (48SW744) is located in a series of sand dunes south of Rock Springs. Frison (1978:114) reports that Folsom projectile points and debitage have been collected from the site.

The Morgan site (48SW773) is also located in sand dunes, but is situated north of Rock Springs. Folsom projectile points and manufacturing debris are mixed with Paleoindian, Archaic, and Late Prehistoric artifacts (Frison 1978:114).

Apparently, the primary weapons used during this time were the composite spear and atlatl. These weapons are thought to have been equipped with lanceolate points, which generally exhibit parallel or parallel oblique flaking patterns.

Early Plains Archaic (8,000-5,000 B.P.)

The Early Plains Archaic Period occurred during a period of aridity, termed the Altithermal (Antevs 1955, Frison 1978). Mulloy (1958) posited a cultural hiatus on the Plains; but more recent investigations indicate that both basins and foothills-mountain regions supported groups of hunter-gatherers dependent upon a diverse set of resources (Frison 1978; Shaw 1980; Eakin 1984).

Several Early Archaic sites or site components have been located within portions of the Wyoming Basin. The Deadman Wash Site (48SW1455) contains Altithermal dates and artifacts in terrace deposits (Armitage et al. 1982). The Split Rock Ranch Site (48FR1484) contains features which have been tentatively defined as pithouses. These features contain hearths which have Early Archaic radiocarbon dates.

Weapon technology at this time involved the composite spear and atlatl. Projectile points are lanceolate with side notches or ears. Recognized complexes include the Blackwater and Pahaska side-notched (8,000-5,000 B.P.), Bitterroot (6,000-5,000 B.P.) and Oxbow (ca. 5,000 B.P.) (Frison 1978:40-46).

Middle Plains Archaic Period (5,000-3,000 B.P.)

During this period, a return to more mesic climatic conditions occurred (Bryson et al. 1970; Baker 1983). There appears to be a significant increase in the number and spatial distribution of sites when compared to the preceding period. Human groups seem to have expanded into the interior basin environmental zones and communal bison hunting became widespread on the northwestern Plains. Hunting methods employed include arroyo trapping, corralling and jumping. Use of other game animals such as mule deer also occurs (Frison 1978:273). Increased use of plant foods is suggested by the appearance of storage pits and slab grinding stones (Frison 1978:46-47).

Diagnostic artifacts include projectile points of the McKean Complex (Mulloy 1958). There are a number of variants which include Duncan, Hannah and McKean, as well as several other destinctive types (Kornfeld and Todd 1985). Frison (1978:47) also includes the flat sandstone grinding stone and sandstone mano as diagnostic artifacts.

Within the Sage Creek Basin, scattered surface finds of Middle Archaic projectile points have been reported. Elsewhere, within nearby portions of the Wyoming Basin, the Cow Hollow Creek site and the Pine Springs site both contain Middle Archaic components which have been excavated. Subsistence activities at these sites apparently focused around procurement of small to medium sized animals, in addition to harvesting wild plants (Schock et al. 1982:120).

Late Plains Archaic Period (3,000-1,500 B.P.)

The climate during this period probably approached modern conditions (Mulloy 1965; Wendland 1978). Subsistence continued to be oriented around broad spectrum foraging activities, but there appears to be a greater emphasis on communal bison procurement. Certain kill locations indicate that sophisticated bison hunters used corrals to trap bison (Frison 1971).

Projectile point styles change during this period. Corner notched Pelican Lake and side-notched Besant types become common. Late Archaic period projectile points have been found throughout the Sage Creek Basin. Buried sites outside of the Sage Creek Basin include Deadman Wash (Armitage et al. 1982) and Cow Hollow Creek (Schock et al. 1982).

Late Prehistoric/Protohistoric Periods (1,500-100 B.P.)

The Late Prehistoric period was a time of increasing population and regional diversification throughout southern Wyoming. For the first time there is evidence of specific historic cultural and ethnic groups. The Wyoming Basin in general appears to have been a zone of contact between cultural groups from both the Great Basin and the Northwestern Plains (Larson et al. 1984). These groups include the Shoshone, Plains bison hunters such as the Crow, and the Fremont in the Great Basin (Reher and Frison 1980).

There appears to have been a continuation of the generalized hunting and gathering subsistence pattern, but increases in bison populations (Roe 1951) may have caused some groups to become more specialized hunters. The increase in bison populations appears to have influenced the movement of many cultural groups entering the Northwestern Plains (Reher and Frison 1980).

This time period has traditionally been distinguished from the earlier periods by the appearance of the bow and arrow, ceramics, and in some areas, horticulture. Projectile point size decreased significantly (Fawcett and Kornfeld 1980), indicating rapid acceptance of the new weaponry (Frison 1978:62-72). However, even with the acquisition of ceramics and the bow and arrow, many of the Late Prehistoric groups occupying the more arid regions of the Plains continued to employ generalized, archaic-like, means of subsistence (Frison 1978). Diagnostic projectile points include Avonlea, Prairie Side Notched and Plains Side Notched (Frison 1978).

Although no buried Late Prehistoric period sites have been excavated within the Sage Creek Basin, a large number of sites containing projectile points from this period have been reported. Sites in southern Wyoming include the Cow Hollow Creek site (Schock et al. 1982), the Inman Buffalo site (Latady et al. 1984), the Bates Hole site (Moe and Todd 1983) and Robbers Gulch Burials (Eckles 1983).

The Protohistoric period marks the early phases of contact between expanding Euro-American populations and the indigneous hunting and gathering cultures. The period begins with the appearance of Euro-American trade items and the horse. Trade items include cooking pots, metal arrow points, knives and firearms. The horse caused one of the most dramatic and rapid changes in life on the Plains. It is during this time that the mounted Plains Indian cultures developed and flourished.

CHAPTER 4
RESULTS

William R. Latady, Jr., Michael McFaul and James A. Truesdale

This chapter presents the field techniques that were used to recover the archaeological information as well as the results of the investigations. Some of the material discussed here has appeared in earlier reports (Trapp 1982; Latady 1982a). This material is included to provide a synthesis of the archaeology.

Four prehistoric sites were recorded during the survey of the proposed road improvements. Table 4.1 contains a brief summary of these sites. Feature attributes are summarized in Appendix 2. Radiocarbon dates are tabulated in Appendix 3.

Field Procedures

The following field procedures were employed to investigate the four sites. A central datum was established at each site and all artifacts and features noted on the surface, within and outside of the proposed right-of-way, were flagged. Their locations were then point plotted with an engineer's transit. Particular topographic features such as draws or ridges. Collections of all chipped and ground stone artifacts within the right-of-way were made. Also collected were chipped stone tools such as projectile points or bifaces outside of the right-of-way.

Subsurface investigations were accomplished by hand with shovels, trowels and brushes. Sediments were dry screened through 1/4" mesh hardware cloth. Excavation occurred in 1 x 1 and 1 x 2 m units. Vertical control was maintained in arbitrary 10 cm levels until a natural or cultural stratigraphic break was encountered. All chipped and ground stone artifacts were collected and placed in cloth bags with provenience information noted on the bag.

All features encountered were photographed, drawn and described. Each was excavated as a separate entity. Charcoal and soil samples were collected whenever possible. The soil samples were obtained for flotation analyses (See Appendix 4). Charcoal samples were submitted to Radiocarbon LTD and Beta Analytic Inc. to date the use of the feature.

Vegetation was sampled at 48CR3815 using the Daubenmire Canopy Coverage Method (Daubenmire 1959). As used in this study, this method consisted of stretching a 50 m line across the sample area and a one-meter-square sampling frame being placed at 10 m intervals along the line. All plant taxa within the frame were identified and a visual estimate was made of the percentage of ground cover occupied by each species. In addition, edible plants within each frame were tabulated, providing density data for these species.

Surface Fire-Affected Rock

Relatively high densities of fire-affected rock were noted at two sites. These rocks are inferred to be by products of hearths which

Table 4.1. Summary of archaeological sites recorded during the Sage Creek project.

Site No.	Description	Time Period	Site Size
48CR3812	Short term camp	Late Prehistoric Late Archaic	1,500 m^2
48CR3813	Limited activity	Unknown	15,000 m^2
48CR3814	Short term occupation	Middle Archaic	2,000 m^2
48CR3815	Campsite	Paleoindian, through Late Prehistoric	60,000 m^2

probably served a number of different purposes. Hearth function has been addressed elsewhere (Frison 1978; Chapman 1980; Sanders et al. 1982; Guernsey 1984) and includes cooking, heating, lithic raw material preparation and ceremonial purposes. It is suggested that, to a certain extent, these functions of hearths should be reflected in their morphology.

In order to accurately record the large number of rocks found, a grid system was devised and superimposed over portions of the site areas. This grid consisted of one or more 10 x 10 m units at each site. All fire-affected rocks were divided into three categories: reddened, broken, and shattered. Fire-reddened rocks presumably have been turned red by the application of heat or fire. Broken rocks are those that have been split at least once as the result of heat. Rocks often develop cracks when subjected to heat and they fracture easily along those cracks leaving very clean breaks and straight edges. Most of the rocks found that were assigned to this category had only broken once. Shattered rocks are the result of the actual explosion of a heated rock. This reaction generates many small pieces of rock which exhibit jagged edges.

All rocks were mapped in place and recorded on a unit map. The rocks were then counted and size graded into four categories: 1) smaller than 5 cm; 2) 5 to 10 cm; 3) 10 to 15 cm; and, 4) greater than 15 cm for the longest dimensions.

All fire-affected rock was weighed by each 10 x 10 m unit. Material type was not recorded, since the majority of rocks were quartzite.

48CR3812

This site is located at an elevation of 2164 m (7100 ft) on a ridgetop between two unnamed ephemeral tributaries of Sage Creek. The area on which the site is situated has a slight southwestern exposure.

Chert and quartzite gravels occur along this ridge east of the present site area on the eastern side of the road. Weathering processes have caused some of these cobbles to fracture and spall. Soils at the site consist of a tan sandy silt. These sediments become very compact within 15 cm (6") of the present ground surface. A check of the road cut and excavation of two test units indicated a cobble lens occurred close to the ground surface. There is little potential for buried deposits.

A sagebrush-shortgrass community is present at the site today. Plants noted include bluegrass, indian ricegrass (*Oryzopsis hymenoides*), multiflowered phlox (*Phlox multiflora*), spoonleaf milkvetch (*Astragalus spatulatus*), plains pricklypear and big sagebrush.

Archaeological Materials

This site consists of a large low-density scatter of artifacts, features and fire-affected rock. Both historic and prehistoric components are present (Figure 4.1). Two test units were excavated, but no buried artifacts were located.

The historic component is a low density modern artifact scatter, which includes cans, shell casings, baling wire and a whiskey bottle.

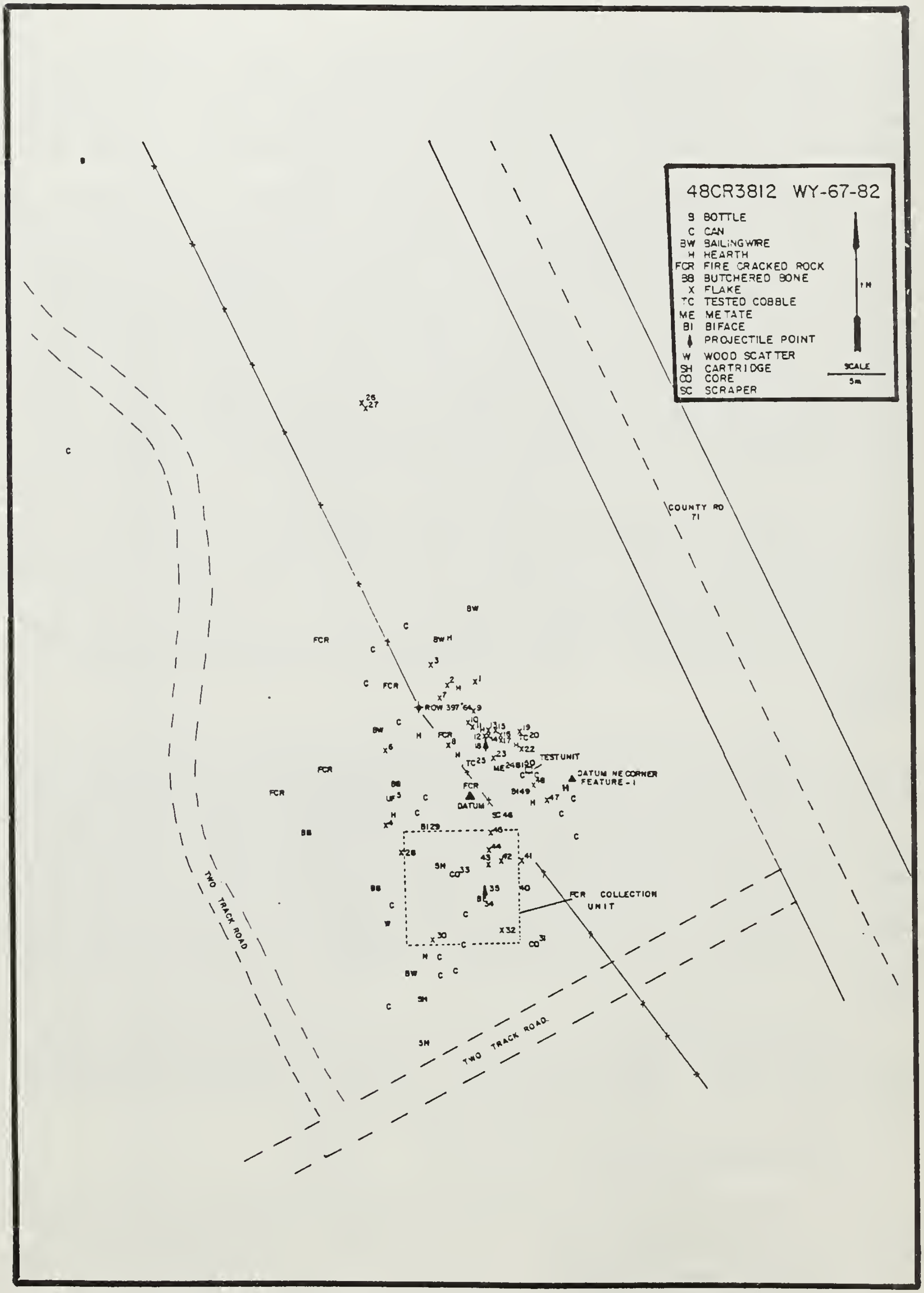

Figure 4.1. Distribution of artifacts, features, and test units, 48CR3812.

Artifact locations were recorded, but no collections were made. Artifact frequencies appear in Table 4.2. The historic component probably represents a sheepherder camp. The type and condition of all but one artifact indicate that occupation occurred within the last 10 years. The presence of a single solder dot, solder patch, crimped seam can may indicate an earlier historic use of the site. This type of can was manufactured between 1898 and 1922 (Rock 1981) and it is possible this site was occupied at that time.

The prehistoric component consists of a low density lithic scatter. Fire-affected rock, features and chipped and ground stone artifacts were mapped.

Two 1 m^2 test units were excavated at the site. Cultural material was found only in Test Unit 1, which was excavated around the hearth designated as Feature 1. Both units were excavated to a depth of 20 cm below surface. The fill in both units consists of a fine silty sand which became extremely compact at about 15 cm below surface. Poorly sorted gravels were found in these sediments.

Besides the hearth, fire-affected rock, floral and faunal remains and one tertiary flake were found in Test Unit 1. This flake was recovered during flotation analysis of the hearth fill and was analyzed as one of the surface artifacts.

Lithics

Forty-five prehistoric artifacts were recovered at the site. The lithic raw material assemblage is composed primarily of non-dendritic chert and siltstone (Table 4.3). Also present are Morrison quartzite, sandstone, bioclastic chert and quartzite.

The largest artifact category consists of secondary flakes followed by tertiary flakes and primary flakes. Five cores and tested cobbles of locally occurring raw materials were also recovered. Three bifaces, one retouched flake, and one utilized flake were found. Formal tools collected include one end scraper, two projectile point fragments (Appendix 5) and a metate.

Features

The one feature located consisted of a shallow basin-shaped hearth containing charcoal and fire-affected rock (Figure 4.2). Seventy quartzite and sandstone fire-affected rocks weighing 24 kg (53 lbs) were present in the hearth. Both flotation and charcoal samples were recovered and submitted for analysis. A radiocarbon date of 1220 B.P. ± 110 (A.D. 750 ± 130) was obtained from the charcoal.

Results of the flotation analysis are presented in Appendix 4. Macrofloral remains were identified from five taxa (Table 4.4). Seeds and fruits from two taxa, the buckwheat family (polygenaceae) and saltbush (Atriplex sp.), were charred. Although the presence of charred seeds might indicate their use as food, the low number of seeds recovered provides little data to support claims of intensive plant gathering by the prehistoric inhabitants of 48CR3812.

Table 4.2. Historic artifact frequencies at 48CR3812

Frequency	Description
17	Regular seam food cans
2	Solder dot milk cans
4	Pieces of baling wire
2	30.06 shell casings
1	.243 shell case
1	Solder dot-solder patch food can
1	9 volt battery
1	Wire nail
1	Razor blade,double edged
3	Post-cranial sheep elements
1	Whiskey bottle
1	Wood scatter

Table 4.3. Summary of lithic artifacts at 48CR3812.

RAW MATERIAL	PRIMARY FLAKE	SECONDARY FLAKE	TERTIARY FLAKE	CORE	TESTED COBBLE	UTILIZED FLAKE	RETOUCHED FLAKE	ENDSCRAPER	BIFACE	PROJECTILE POINT	METATE	TOTAL
Non-dendritic chert	3	7	5	1	1		1	1		1		20/43.5%
Quartzite	1		3	1					2	1		8/17.4%
Bioclastic chert									1			1/2.2%
Siltstone	3	6		1	1	1						12/26.1%
Sandstone											1	1/2.2%
Morrison Quartzite			4									4/8.7%
	7/15.2%	13/28.3%	12/26.1%	3/6.5%	2/4.3%	1/2.2%	1/2.2%	1/2.2%	3/6.5%	2/4.3%	1/2.2%	46/100%

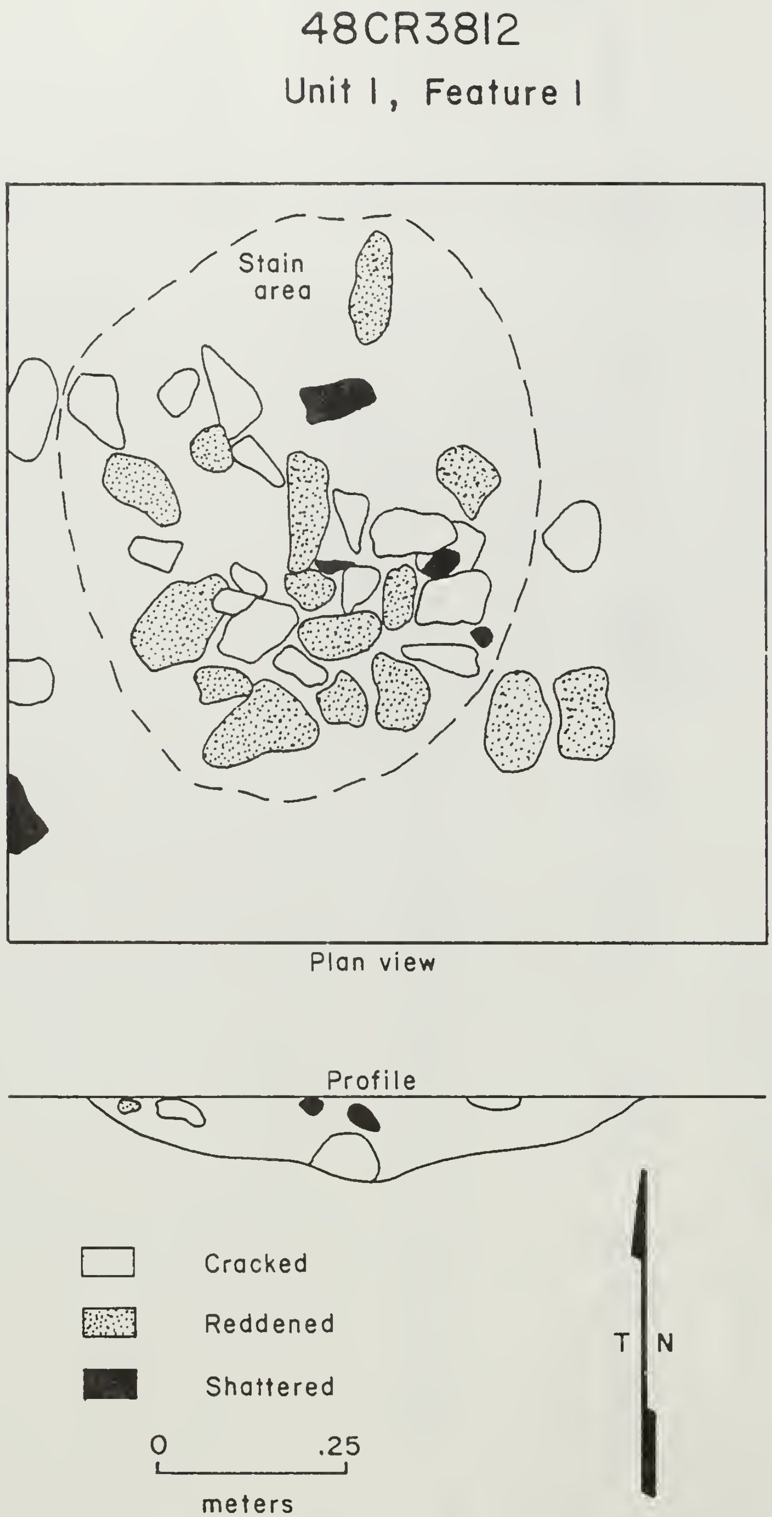

Figure 4.2. Plan view and profile of Feature 1, 48CR3812.

Table 4.4. Summary of macrofloral remains recovered from flotation samples at 48CR3812.

Taxa	Seeds/Fruits	Wood	Comments
Artemisia tridentata	--	Fair amount	--
Atriplex sp.	5 seeds	--	4 charred
Polygonaceae	1 fruit	--	Slightly charred
Oryzopsis hymenoides	1 fruit	--	Not charred
Boraginaceae	1 fruit	--	Not charred
Unidentified	2 fruits	--	Not charred

Faunal Remains

Faunal materials were recovered in the heavy fraction of the flotation analysis from Test Unit 1. Taxa identified include rodents and a possible mammal or reptile (Table 4.5). Eighteen bones or bone fragments were recovered, but only three showed any evidence of cultural modification. The remaining faunal elements appeared to be intrusive.

Fire-Affected Rock

A single 10 x 10 m collection unit was established at 48CR3812, and 341 pieces of fire-affected rock were recorded (Figure 4.3). Of these, 59 (17.3%) were fire reddened, 41 (12%) were broken, and 241 (70.7%) were shattered (Table 4.6). There were 150 (44%) rocks smaller than 5 cm, 180 (52.8%) were between 5 and 10 cm, 9 (2.6%) were 10-15 cm, and 2 (0.6%) were larger than 15 cm. The average weight of each fire reddened rock was 623 grams, broken rock averaged 443 grams a piece, and each shattered rock average 149 grams.

48CR3813

This site is located at an elevation of 2158 m (7080 ft) on the second (T2) terrace of an unnamed seasonal tributary of Rasmussen Creek. At this locality the terrace has a 1° slope to the west.

Much of the vegetation on the site has undoubtedly been disturbed as a result of road construction activities. The remainder of the site supports a greasewood-shortgrass community. Plant species noted include black greasewood, big sagebrush, saltbush, aster (*Aster* sp.), bluegrass, bottlebrush squirreltail and wildrye (*Elymus* sp.). A shortgrass-sagebrush community is found in the drainage. Taxa noted include big sagebrush, rabbitbrush (*Chrysothamnus* spp.), black greasewood, lupine (*Lupinus* sp.) thistle (*Cirsium* sp.), wheatgrass and wildrye.

Sediments on the terrace surface consist of a fine sandy silt. Potential exists for the presence of intact buried cultural deposits within the terrace system, although none were observed at this locale.

Archaeological Materials

This site consists of a large low density lithic scatter containing both partially intact and deflated hearths, fire-affected rock, tools and debitage (Figure 4.4). Due to the site size, two areas, designated A and B were established. Area A is an extremely low density artifact and feature scatter consisting primarily of hearths. Area B has a higher artifact and hearth density, and contains several tool types (Figure 4.5).

The extremely small lithic raw material assemblage is composed primarily of non-dendritic chert and quartzite (Table 4.7). Also present are one sandstone metate fragment and one dendritic chert biface.

The artifact assemblage is composed primarily of cores. This is unusual since no flakes other than retouched flakes were recorded. Trapp (1982) noted the presence of five non-dendritic chert reduction flakes on the site surface. Apparently, when this site was next recorded, these flakes were no longer visible. Additional artifacts

Table 4.5. Faunal remains recovered from Feature 1, 48CR3812.

CATALOG #	TAXON	ELEMENT	CULTURAL MODIFICATION
CR3812-18	Small mammal/reptile?	Vertebra fragment	None
CR3812-17	cf. Rodentia?	3 longbone fragments	Burned
	Small mammal/reptile?	11 fragments, unidentifiable	None
	cf. Spermophilus	1 incisor, 1 maxilla fragment 1 molar	None

48 CR 3812

FIRE-ALTERED ROCK ANALYSIS UNIT

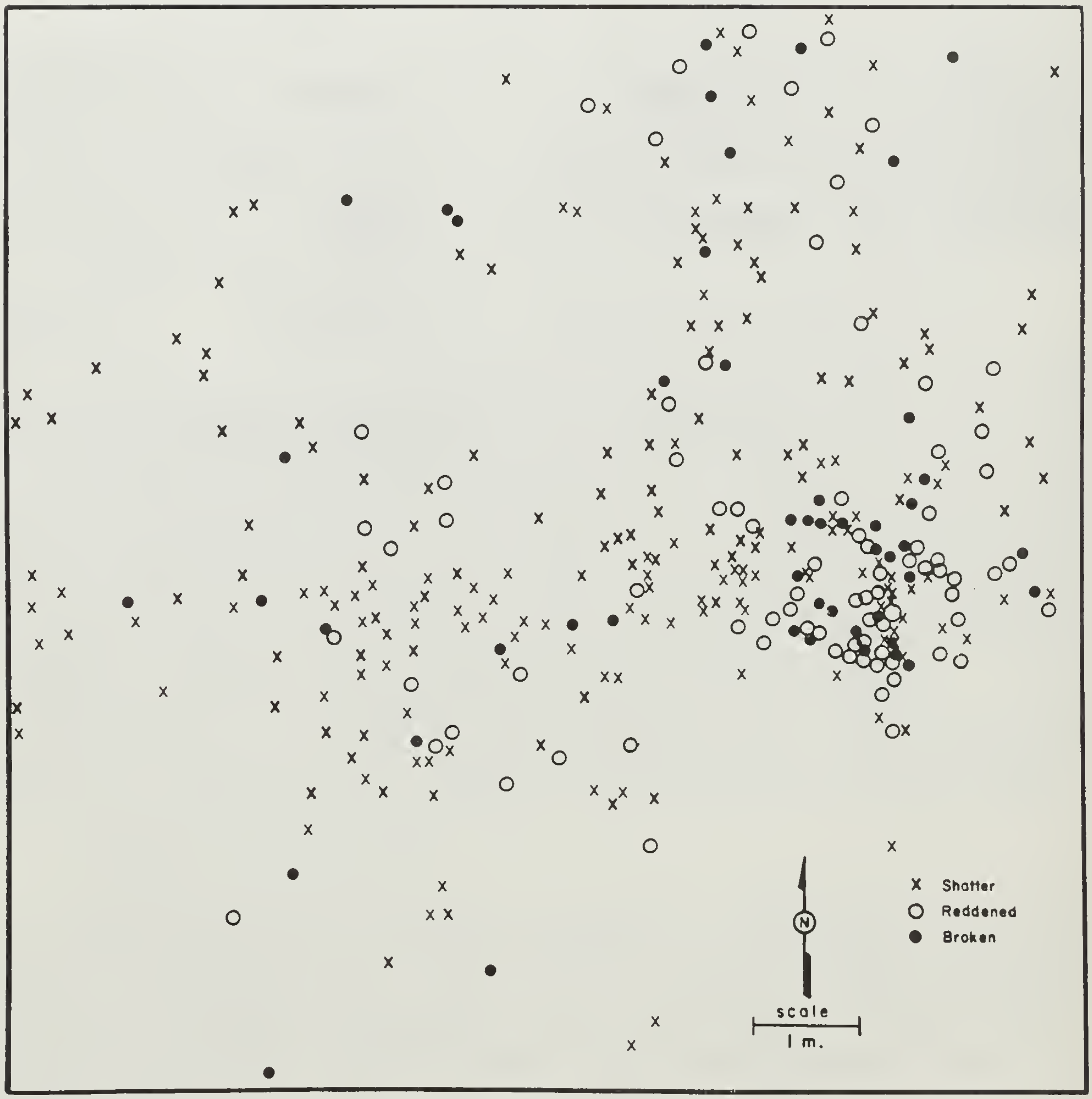

Figure 4.3. Distribution of fire-affected rock, Collection Unit 1, 48CR3812.

Table 4.6. Recorded characteristics of fire-affected rocks at 48CR3812.

	SIZE - CM					
Rock Type	1-5	6-10	11-15	Greater than 15	Total Numbers	Total Weight/kg
Reddened	6	44	7	2	59	36.74
Broken	6	33	2		41	18.14
Shattered	138	103			241	35.83
Total	150	180	9	2	341	90.71

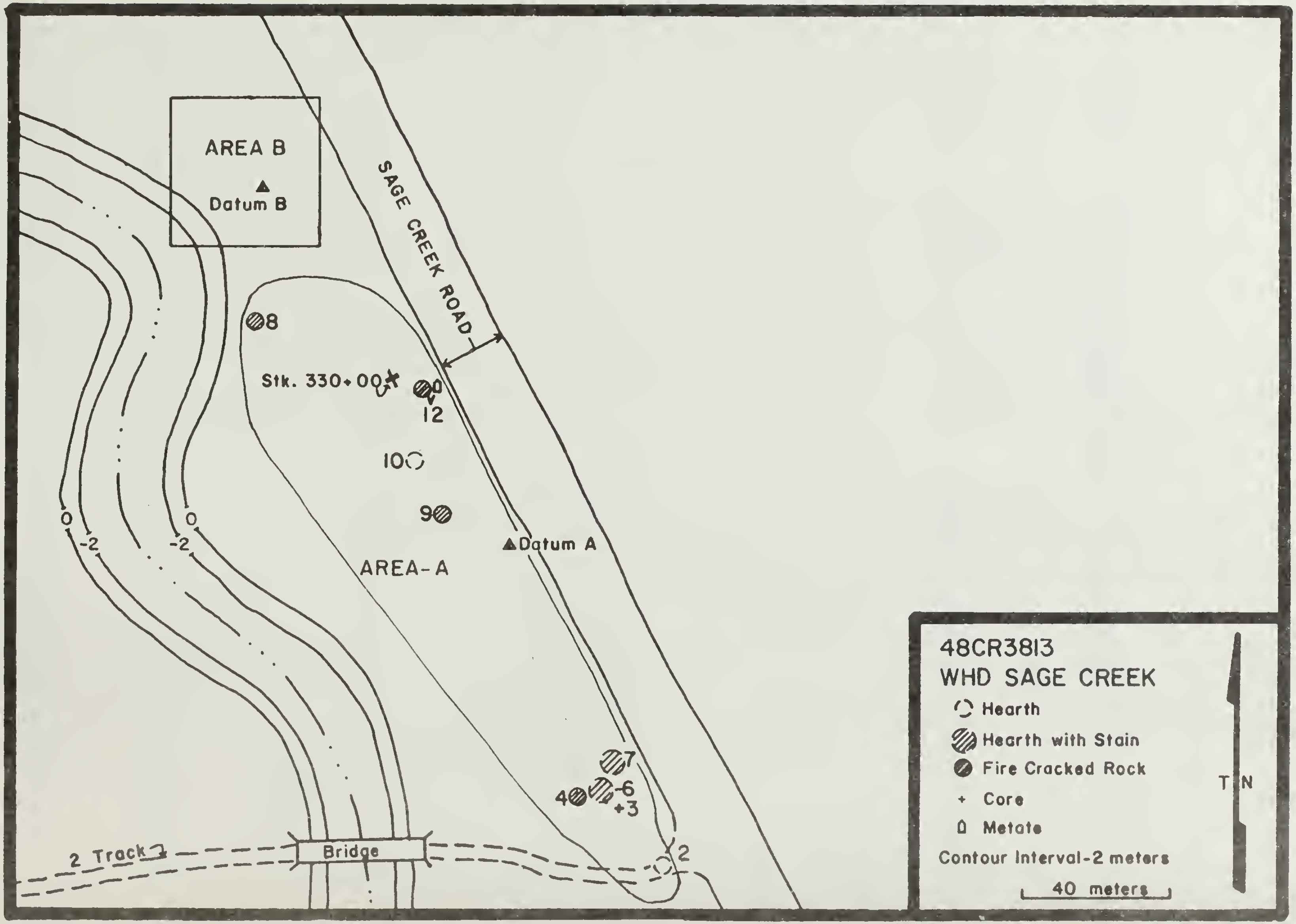

Figure 4.4. Map of 48CR3813.

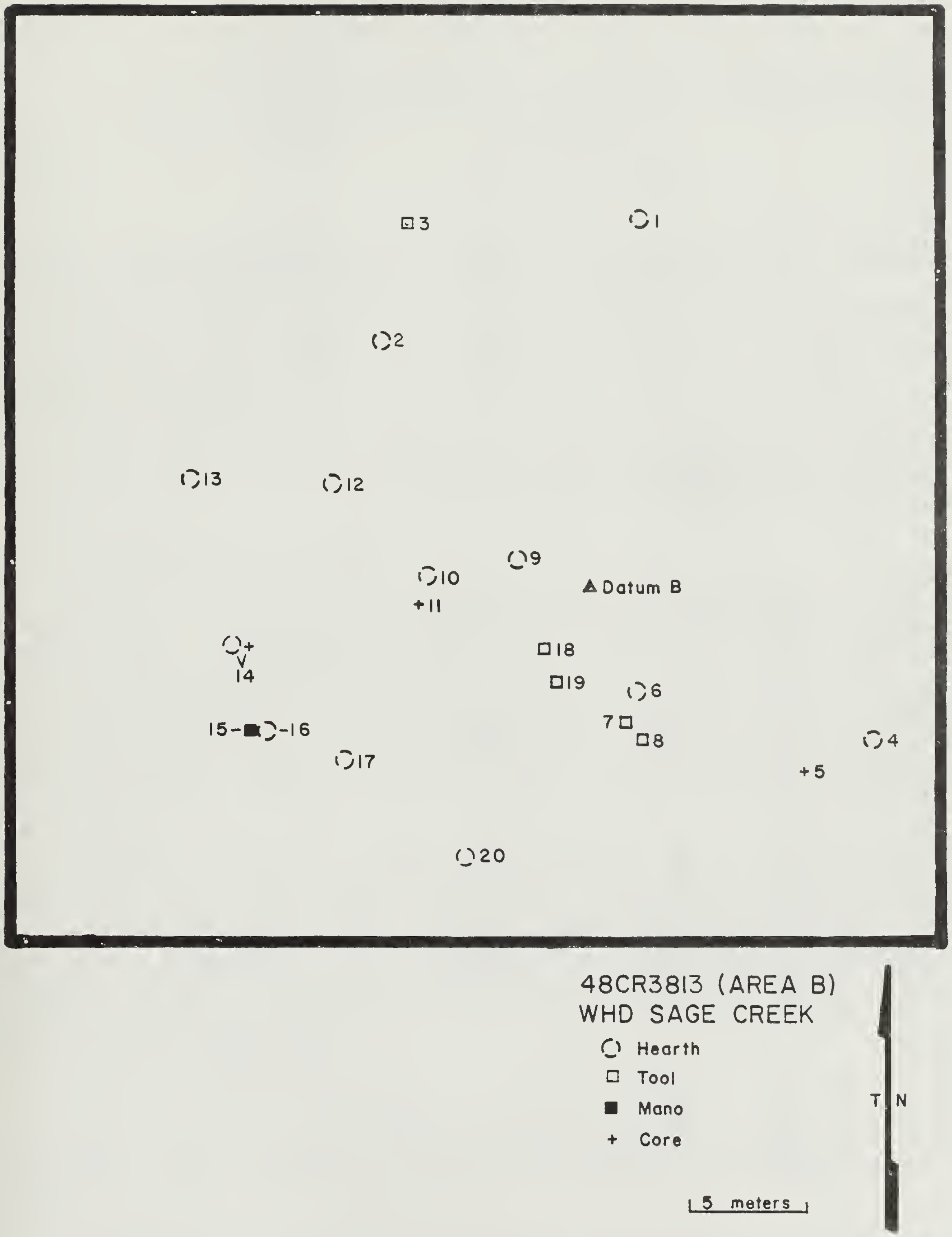

Figure 4.5. Distribution of artifacts and features, in Area B, 48CR3813.

Table 4.7. Summary of artifacts from 48CR3813.

RAW MATERIAL	BIFACE	CORE	ENDSCRAPER	SIDE SCRAPER	RETOUCHED FLAKE	MANO	METATE	TOTAL
Quartzite			1		1	1		3/27%
Dendritic	1							1/9%
Non-dendritic		3	1	1	1			6/55%
Sandstone							1	1/9%
Total	1/9%	4/37%	1/9%	1/9%	2/18%	1/9%	1/9%	11/100%

noted include one biface, one end scraper, one side scraper and one mano.

Thirteen features were recorded. Two of these contained stains, but testing with a trowel revealed little deposition. Soil and charcoal samples were not collected.

48CR3814

This site is located on a north facing finger ridge above an unnamed ephemeral drainage at an elevation of 2158 m (7080 ft). Deadman Springs is situated about 900 m (0.56 mi) northwest of the site.

Sediments on the present ground surface consist of an unconsolidated find sandy silt. No evidence of subsurface cultural materials was discovered during mapping, recording and collection of the site. However, monitoring of construction activities revealed the presence of three buried features (Eckles 1982:1-6).

Present site vegetation consists of a sagebrush-shortgrass community. Taxa noted include, big sagebrush, rabbitbrush, saltbush, plains pricklypear, aster, thistle, bluegrass, wildrye, and Indian ricegrass.

Archeological Materials

This site consists of a 5250 m² surface artifact scatter. Fire-affected rock, hearths, chipped stone tools and debitage were mapped (Figure 4.6). Scattered fire-affected rock was noted on the eastern side of the present Sage Creek Road.

Two hundred forty-six lithic artifacts were collected from the site (Table 4.8). Quartzite and non-dendritic chert comprise the bulk of the raw material assemblage. The remaining raw material types represented include dendritic chert, bioclastic chert, siltstone, oolitic chert, Morrison quartzite, algalitic chert, obsidian, non-volcanic glass and Phosphoria.

Debitage, particularly secondary and tertiary flakes, makes up the bulk of the assemblage. In addition, nine primary flakes, two cores and one tested cobble were found. The tested cobble and one core were made of non-dendritic chert. The remaining core is composed of Morrison quartzite. Three bifaces, 14 retouched flakes, five utilized flakes, a chopper and two cobble tools were also recovered. Only two formal tools, both end scrapers, were noted and collected. These are illustrated in Appendix 5.

Monitoring Activities

Monitoring of highway construction uncovered two buried hearths which were then excavated by hand (Eckles 1982). Both features are described below.

> Fire Pit #1: The blade cut to a depth of approximately 3-5 cm from present surface and exposed a circular charcoal stain. This feature was excavated by first determining the boundary of the stain by trowel scraping and probing. Then, the south one-half was excavated by trowel to determine feature depth

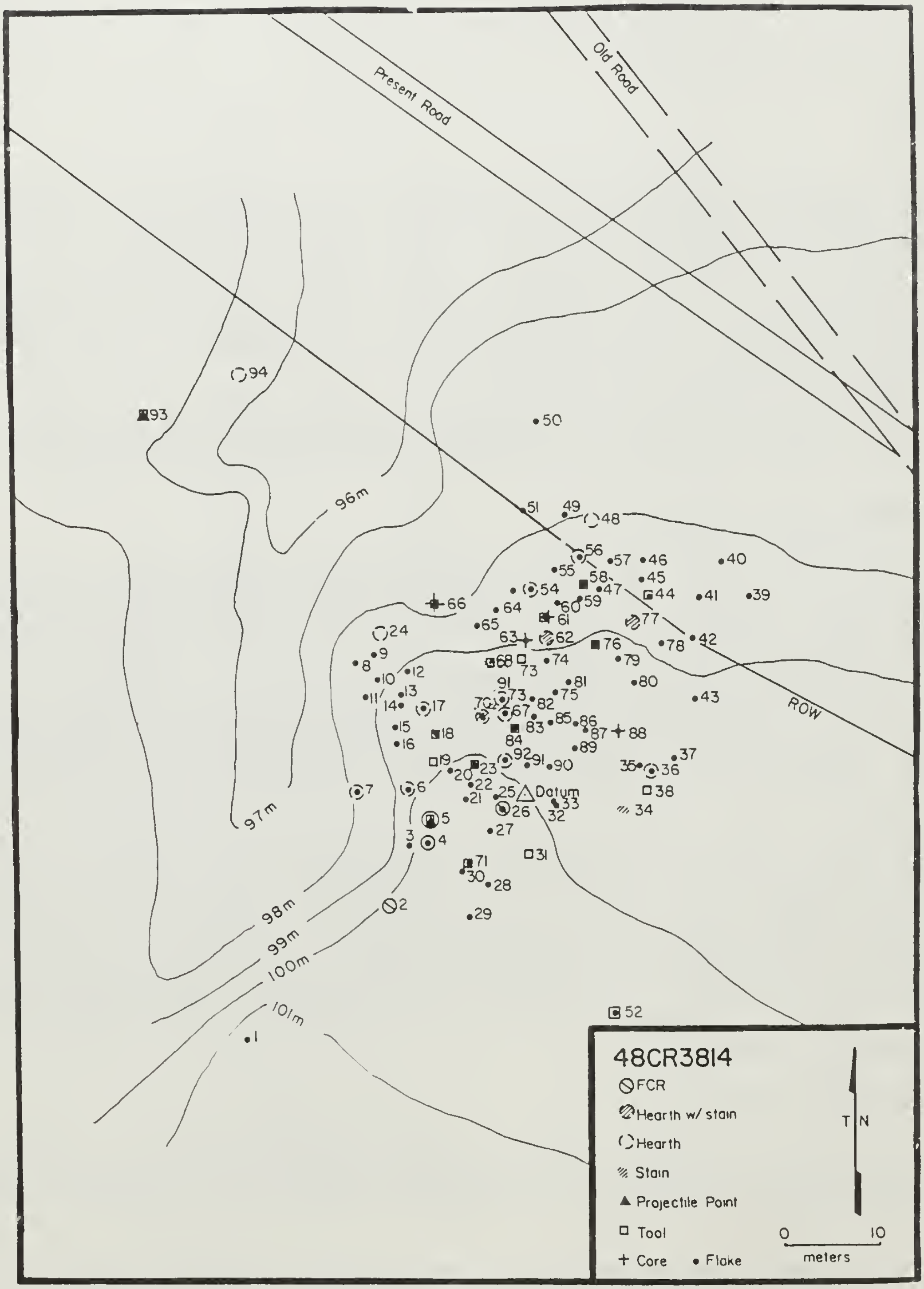

Figure 4.6. Distribution of artifacts and features, 48CR3814.

Table 4.8. Summary of artifacts from 48CR3814.

RAW MATERIAL	PRIMARY FLAKE	SECONDARY FLAKE	TERTIARY FLAKE	SHATTER	CORE	TESTED COBBLE	UTILIZED FLAKE	RETOUCHED FLAKE	ENDSCRAPER	BIFACE	CHOPPER	COBBLE TOOL	TOTAL
Non-dendritic	1	20	48	1	1	1	2	7		2			83
Dendritic		1	18					1	1				22
Quartzite	7	44	20	1			1	6		1	3	1	84
Bioclastic			3										3
Oolitic		1					1					1	3
Siltstone		2	1										3
Morrison Quartzite	1	9	3		1								14
Algalitic		5	5						1				11
Obsidian							1						1
Non-Volcanic Glass		3	4										7
Phosphoria		1	14										15
Column Total	9	87	116	2	2	1	5	14	2	3	3	2	246

and shape. The entire feature was then excavated to recover artifacts, charcoal and a soil sample. Enough charcoal was obtained for a radiocarbon date. A 1 x 1 meter square unit was dug surrounding the feature to a depth of 10 cm from the blade cut. All excavated soil was screened through 1/4" mesh. No artifacts or fire-cracked rock were found (Eckles 1982:1).

Fire Pit #2: The blade cut to a depth of 3-5 cm from the present surface and exposed a fire pit and associated ash feature. The fire pit was excavated in the same way as Fire Pit #1. A great deal of fire-cracked rock was found (23.5 pounds of broken sandstone, over 35 broken pieces). Fire Pit #2 reached a depth of 13 cm below the blade cut. A red/orange oxidation ring was noted all around the feature edge but not in the bottom. One charcoal and two soil samples were recovered.

The ash feature consisted of gray ash and soil with no charcoal. It was circular in shape and only 2 cm deep. No fire-cracked rock was present.

A 1 x 2 meter unit was excavated surrounding these two features to a depth of 10 cm from the blade cut. No artifacts were uncovered (Eckles 1982:6).

A radiocarbon date of 2860 B.C. ± 510 (4210 B.P. ± 360) was obtained from a sample of charcoal in Feature 1. Feature 2 produced a radiocarbon date of 2910 B.C. ± 220 (4200 B.P. ± 130). Both dates indicate a Middle Archaic occupation of the site.

Seeds, fruits, or related structures were not recovered from the soil samples taken from either hearth. However, pieces of burned juniper (*Juniperus* sp.) wood were found.

48CR3815

This site is situated on the terraces above the north side of Sage Creek at an elevation of 2167 m (7110 ft). Artifacts and features were confined to the south facing 1-11° slope of the northern Sage Creek valley wall. The crest of a shallow swale in the wall and the modern 500 m wide floodplain defined the area of investigations.

East of the swale's divide, resting unconformably upon the Frontier formation, is a terrace remnant armored with rounded cobbles. The height of the terrace correlates with two other terrace remnants found on the northern wall of the Sage Creek drainage west of the site and across the drainage along the southern valley wall. The height of the terrace above the modern floodplain, the size of the cobble armor, and its consistency suggest deposition during the Pleistocene.

The position of the isolated terrace northeast of the site, the height of the bedrock valley wall west of the site, the consistency of the cobble armor, and the morphology north and east of the valley wall indicate a more northeastwardly paleodrainage for Sage Creek. This suggests post-Pleistocene downcutting followed by channel abandonment created the swale in the valley wall at

48CR3815. The swale may have provided prehistoric residents a readily accessible route into and out of the Platte River drainage. Today the swale is traversed by two old roads and Wyoming Highway 71.

The site is also traversed by two intermittent drainages which trend off the swale toward Sage Creek. It is suggested that these channels may form the western boundary of 48CR3815, although further excavation and bedrock delineations are needed to refine this inference. East of Highway 71, a Sage Creek meander cuts into the valley wall and forms a boundary for this portion of the site. To the south, the valley wall gradually decreases in gradient to a level floodplain. Although this portion of the floodplain predates the floodplain east of the highway, the extent of the site onto the floodplain is unknown and the problems associated with floodplain occupation must be considered.

Archeological Materials

This site consists of a 60,000 m^2 lithic scatter. Fire-affected rock, features and 350 chipped and ground stone artifacts were mapped (Figure 4.7). Two areas, A and B, were designated for mapping and excavation purposes. Area A is on the western side of the road and Area B is on the eastern side.

At least five buried cultural levels were noted during the cultural resource investigations. Chipped and ground stone tools, debitage and features were found in these levels.

Surface Investigations

The majority of the artifacts recovered on the surface are made from local cherts and quartzites (Table 4.9). Many of these may have been produced from cobbles obtained from the terraces close to the site. Siltstone comprises the next most frequent raw material type. Small quantities of bioclastic chert, oolitic chert, sandstone, and Morrison quartzite also occur.

Chipped stone debitage makes up the bulk of the assemblage. Ten cores and two tested cobbles were noted at the site. Bifaces are the next most numerous artifact type. The majority of the bifaces are made of locally occurring cherts and quartzites. Twelve metate fragments were mapped. It is probable that some of these fragments are from the same metate. Expedient tools, such as retouched and utilized flakes and cobble tools, make up a small part of the assemblage. Three projectile points were recovered, two of these appear to date to the Middle Archaic period and one to the Late Prehistoric period (Appendix 5).

Fire-Affected Rock

Five 10 x 10 m collection units were established for the purpose of examining fire-affected rock. All rocks within each collection unit were described as to size, total number, weight by unit and whether the rock was cracked, shattered or broken (Table

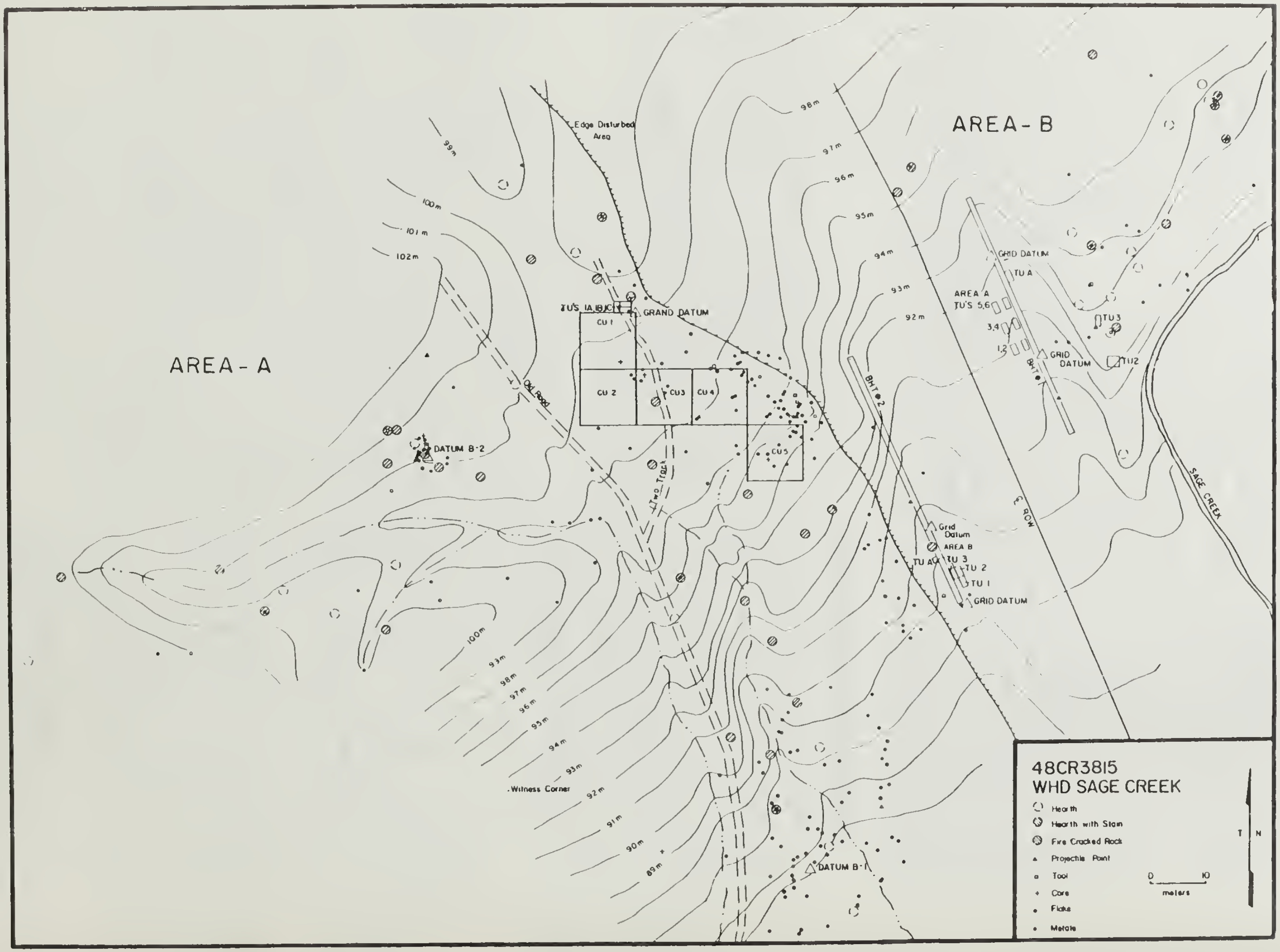

Figure 4.7. Distribution of artifacts, features, trenches, excavation, test and collection units, 48CR3815.

Table 4.9. Summary of artifacts from the surface of 48CR3815.

RAW MATERIAL	PRIMARY FLAKE	SECONDARY FLAKE	TERTIARY FLAKE	SHATTER	CORE	TESTED COBBLE	UTILIZED FLAKE	RETOUCHED FLAKE	BIFACE	PROJECTILE POINT	COBBLE TOOL	METATE	TOTAL
Non-dendritic chert	22	51	101	12	2	5			10	1	1		201/58.9%
Quartzite	6	16	27	3	2		1	1	3		1		60/17.1%
Bioclastic chert	1		3						1				5/1.4%
Oolitic chert			1						1	1			3/0.9%
Siltstone	5	19	19	1	5	2	1	4	2		2		60/17.1%
Sandstone												12	12/3.4%
Morrison Quartzite	1	1	1		1					1			5/1.4%
TOTAL	35/10.0%	87/24.0%	152/43.4%	16/4.6%	10/2.9%	7/2.0%	2/0.6%	5/1.4%	17/4.9%	3/0.9%	4/1.1%	12/3.4%	350/100%

4.10). It was hoped that recording these attributes would contribute to interpretations concerning the original function of the fire-affected rock.

Twelve hundred fifty-two pieces of fire-affected rock were recorded and mapped (Figure 4.8). Eighty-eight (7%) were fire-reddened, 136 (10.8%) were broken and 1028 (82.2%) were shattered. Size grading in 5 cm increments for all of the rocks recorded indicates that nearly all of those found were between 0-10 cm (98.3%). There were 716 (57.1%) rocks smaller than 5 cm, 515 (41.1%) were 6-10 cm and 21 (1.8%) were 11-15 cm. The average weight of fire-reddened rock was 435 grams, broken rock averaged 351 grams and shattered rock averaged 98 grams.

The largest amount of rock was recorded in Unit 4 (44.1%). Four hundred sixty-nine shattered, 39 broken, and 45 reddened rocks were found in this unit. Unit 2 contained only the 69 rocks including the fewest broken and shattered rocks. The smallest amount of reddened rocks was found in Unit 3.

Mean weight of rock was calculated for each unit to correct for the correlation between rock size and weight. That is, units containing moderate numbers of rocks might exhibit low overall weight values because of small rock size. The unit with the greatest mean weight for fire-reddened rock was Unit 2 (525 grams). Unit 4 had the lowest mean weight (400 grams) for the same category. Unit 5 had the greatest mean weight for broken rock (450 grams) and Unit 1 showed the lowest, only 245 grams. Unit 5 also had the greatest mean weight for shatter (113 grams), while Unit 3 showed the least (55 grams). Total mean weights for each rock type were as expected, with reddened rocks having the greatest weight (2294 grams), broken rocks weighing less (1827 grams), and shattered rocks weighing the least (413 grams).

Subsurface Investigations

Excavation proceeded by digging five test units, 11 excavation units and two backhoe trenches. All of these were selected using a judgemental sampling strategy designed to minimize overall impact to the site while obtaining as much information as possible. These excavations allowed correlation of soil horizons throughout the site (Figure 4.9). The backhoe trenches were especially useful in making stratigraphic and pedological observations describing stratigraphy, soil development and the nature of sediment deposition. Soil samples were taken within each stratigraphic unit to supplement the observations made in the field. The results of the pedological analysis appear in Appendix 1.

The five test units helped to define the extent of the subsurface deposits. Unfortunately, none of these units was completed due to time constraints. They did reveal that buried deposits exist on both sides of the highway.

Eleven excavation units were placed adjacent to the two backhoe trenches (Figure 4.10). All of these units were systematically placed above charcoal lenses noted in the walls of the backhoe trenches.

Table 4.10. Summary of fire-affected rock in collection units.

C.U.	TYPE	0-5	6-10	10-15	TOT	(kg) WEIGHT	MEAN WEIGHT
1	Reddened	0	7	2	9	4.05	.45
	Broken	0	27	2	29	11.25	.388
	Shatter	75	25	0	100	8.55	.085
	Total	75	56	4	138	23.85	.173
2	Reddened	0	4	2	6	3.15	.525
	Broken	0	10	1	11	4.5	.409
	Shatter	42	10	0	52	3.83	.074
	Total	42	24	3	69	11.48	.166
3	Reddened	0	4	1	5	2.25	.45
	Broken	1	28	4	33	8.1	.245
	Shatter	115	33	0	148	8.1	.055
	Total	116	65	5	186	18.45	.099
4	Reddened	6	37	2	45	18.0	.40
	Broken	7	29	3	39	13.05	.335
	Shatter	319	150	0	469	40.95	.087
	Total	332	216	5	553	72.00	.13
5	Reddened	4	17	2	23	10.8	.469
	Broken	0	22	2	24	10.8	.45
	Shatter	147	112	0	259	29.25	.113
	Total	151	151	4	306	50.85	.166

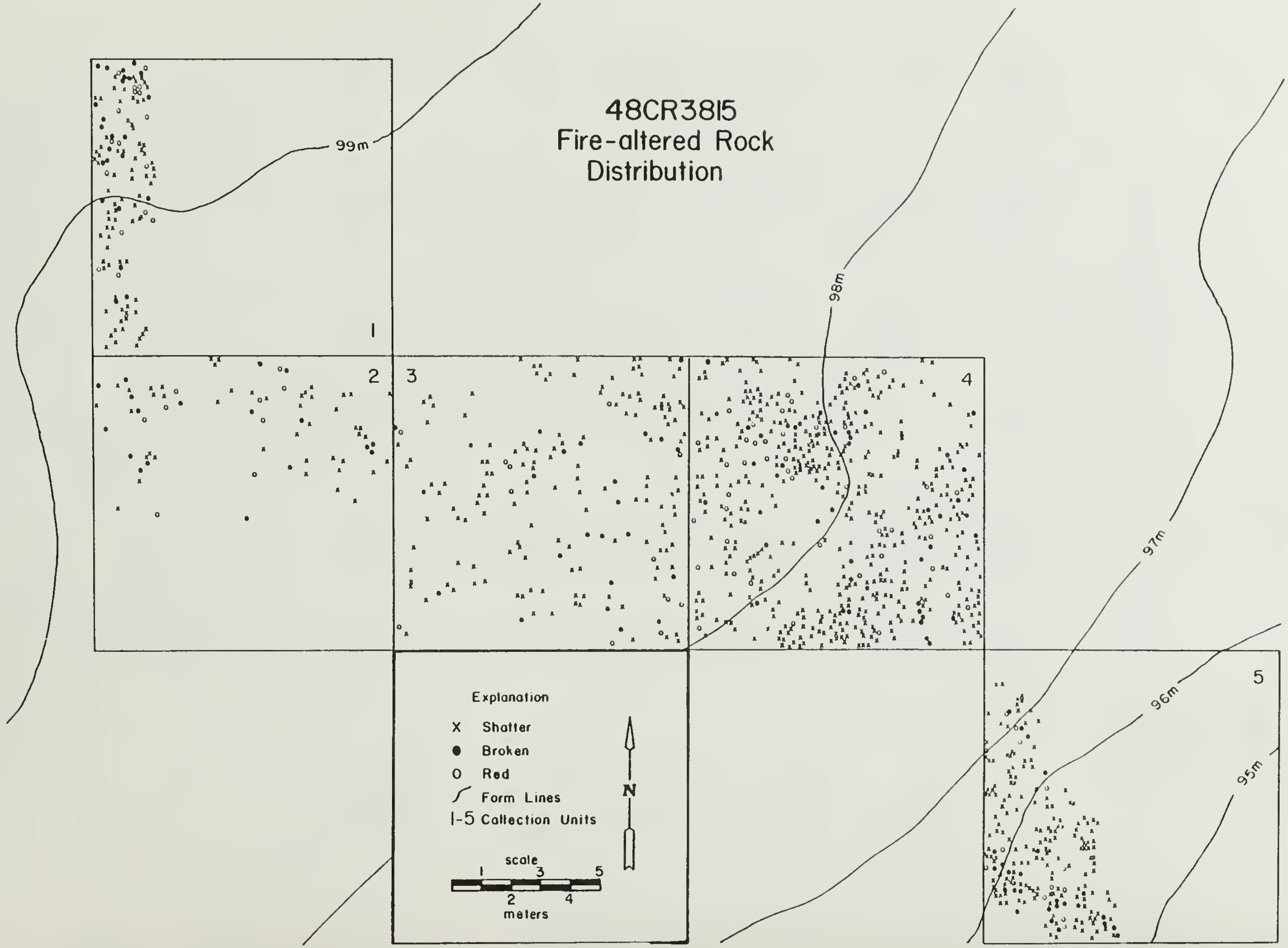

Figure 4.8. Fire-affected rock distribution.

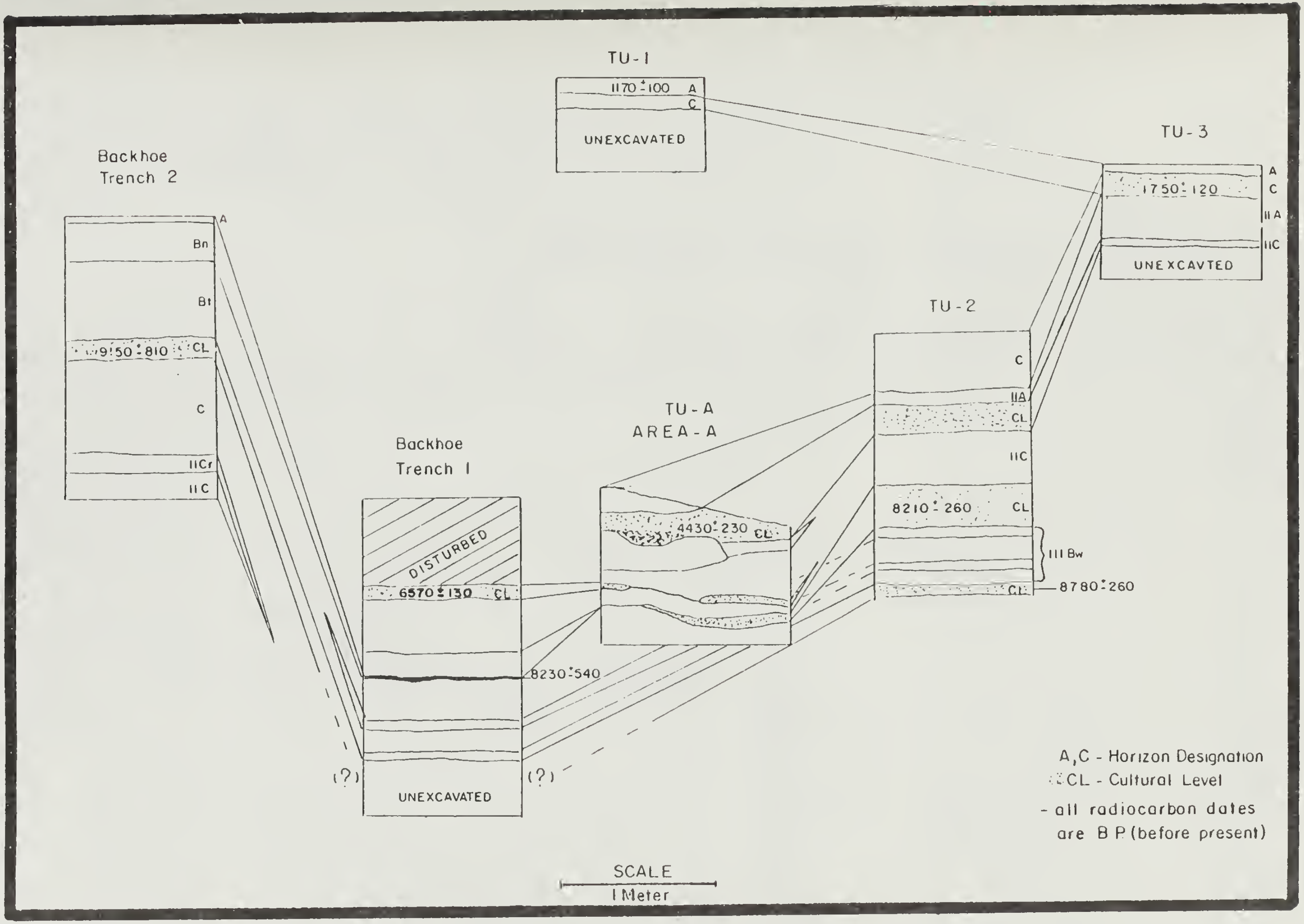

Figure 4.9. Schematic soil profile of Areas A and B at 48CR3815.

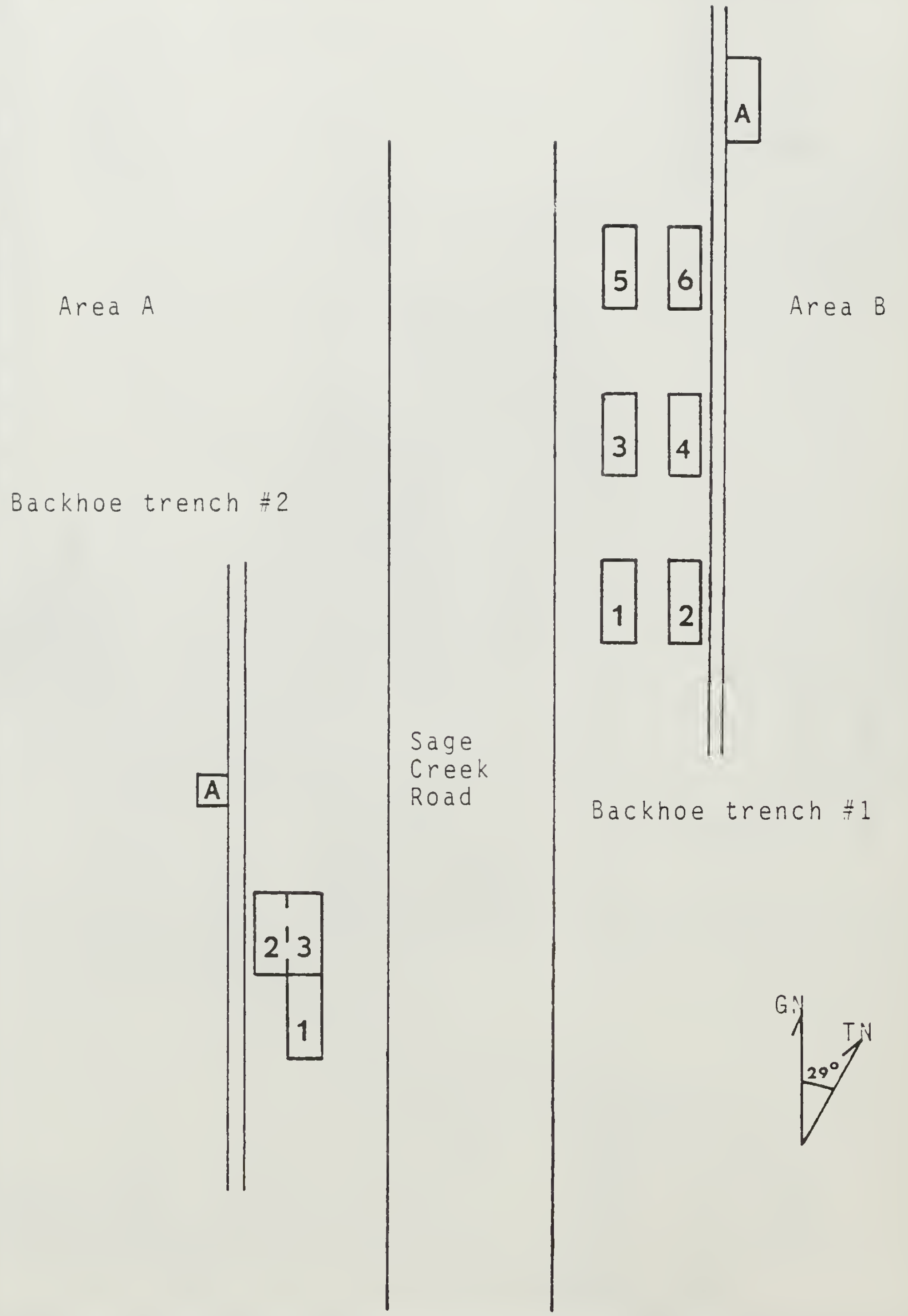

Figure 4.10. Sketch map of excavations within the right-of-way at 48CR3815.

Archaeological materials recorded in test units, backhoe trenches and excavation units are described by dated cultural level. Artifacts and features not associated with a known temporal level are also described.

Late Prehistoric Period Level (1170 B.P.)

Artifacts and features dating to this period were all located on or within 10-15 cm (4-6") of the present ground surface. The horizontal extent of this occupation is not known because of factors which include disturbance by previous road construction, time and right-of-way constraints and the presence of cultural material dating to three time periods on the ground surface. All intact evidence of this level was found in Test Units 1a, 1b, and 1c.

Features

Test Unit 1a was originally established around Feature 1 and later expanded to the north and west to expose two other features found during excavation of this unit. These additional areas were termed units 1b and 1c respectively (Figure 4.11).

Feature 1 was a shallow basin-shaped hearth containing sandstone and quartzite rocks. Flotation and charcoal samples were recovered and submitted for analysis. A radiocarbon date of A.D. 800 ± 120 (1170 ± 100 B.P.) was obtained from the charcoal. Complete results of the flotation analysis appear in Appendix 4. Briefly, macrofloral remains were identified from 14 taxa. Seventy (90%) of these remains were charred and included seeds from goosefoot (Chenopodium sp.), sedges (Carex spp.), povertyweed (Monolepis nuttalliana), seablite (Suada sp.), one seed and one fruit from saltbushes, one fruit or one seed each from bulrush (Scirpus sp.), spikerush (Eleocharis sp.), miner's candle (Cryptantha sp.), and from the families of roses (Rosaceae), composites (Compositae) and legumes (Leguminosae). The remaining eight seeds or fruits are not charred and may represent modern intrusives (Table 4.11). All of the macrofloral remains recovered during the flotation procedures occur at or near the site today.

Feature 2 was an amorphous fire-affected sandstone and diorite concentration containing a small amount of charcoal. This feature reached a maximum depth of 6 cm and may have been the remains of a cleanout episode from Feature 1.

Feature 3 is a roughly circular sandstone rock concentration containing fire-affected rock, three fragments of ground stone, charcoal flecks and a slight amount of oxidation around the edges. The amount of charcoal contained in the feature was too small for a radiocarbon date. The rocks on the edges of the feature slope downward toward the center forming a shallow basin. The general configuration is that of a small slab-lined hearth.

Feature 4 may also represent the debris from cleaning out a hearth. Only the eastern portion of the feature was excavated, so its exact size is not known. Fire-affected sandstone and charcoal

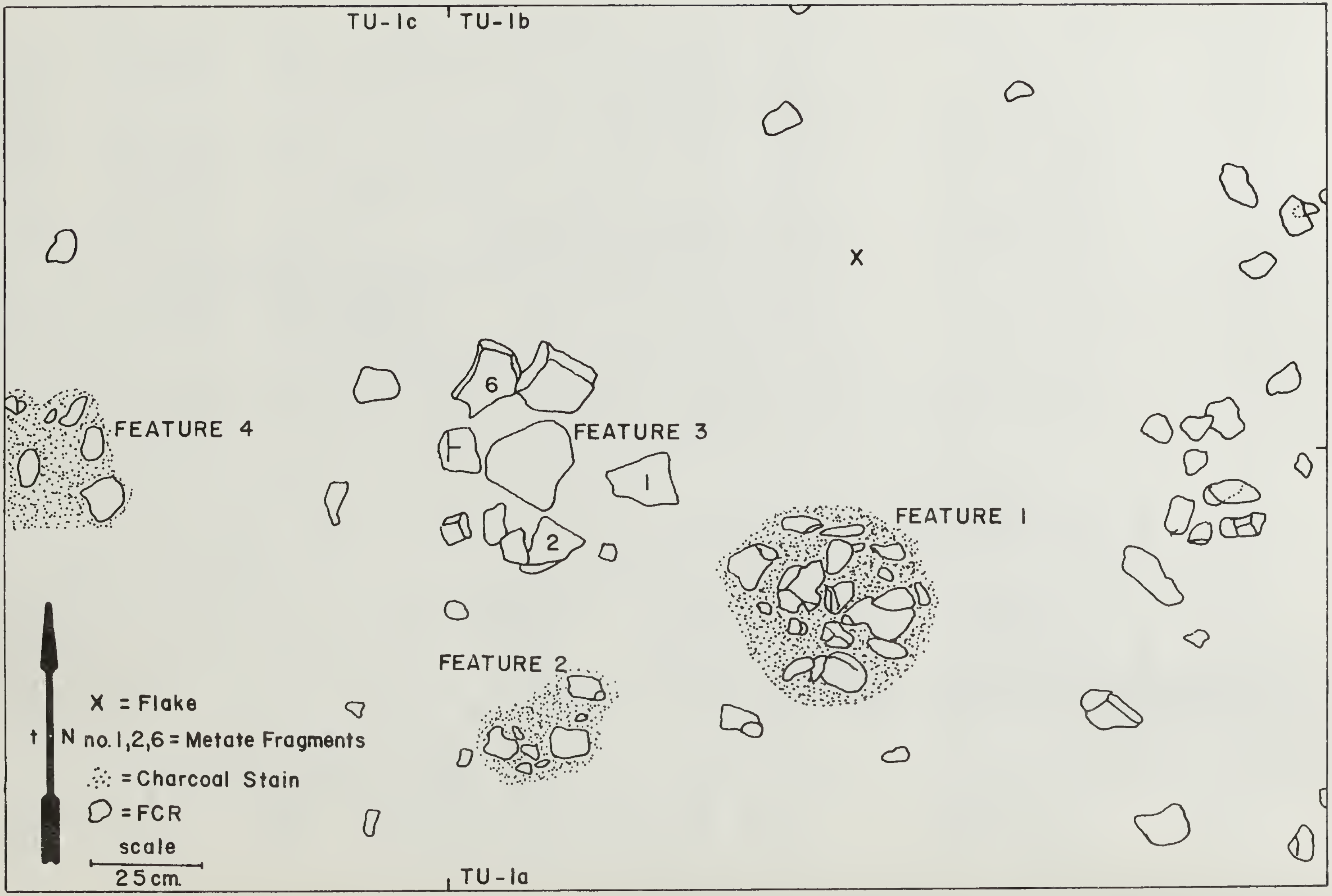

Figure 4.11. Plan view of the Late Prehistoric Period level.

Table 4.11. Summary of macrofloral remains from flotation samples in Feature 1, Area A, 48CR3815.

TAXA	SEEDS/FRUITS	WOOD	COMMENTS
Artemisia tridentata	--	Huge amount	--
Populus sp.	--	Huge amount	--
Chenopodium sp.	50 seeds	--	all charred
Monolepis nuttalliana	7 seeds	--	all charred
Atriplex spp.	5 fruits	--	1 charred
	1 seed	--	charred
Carex spp.	3 fruits	--	2 charred
Scirpus sp.	2 fruits	--	1 charred
Suaeda sp.	2 seeds	--	charred
Eleocharis sp.	1 fruit	--	charred
Cryptantha sp.(?)	1 fruit	--	charred
Leguminosae (Astragalus (?))	1 seed	--	charred
Rosaceae	1 seed	--	charred
Compositae (?)	1 fruit	--	charred
Arenaria hookeri	1 flower and calyx	--	not charred
Oryzopsis hymenoides	1 fruit	--	not charred
Unknown	1 seed	--	charred

flecks were noted. Oxidation was not present within the excavated portion of this feature.

Fire-affected sandstone occurred east of Feature 1. An attempt to refit this rock with any of those found in the features or with one another was unsuccessful. It is possible these rocks were cleaned out of the features, or they were from another hearth, or they were portions of a living structure, such as a wickiup or tipi ring. If contemporaneous, the hearths and apparent clean-out piles would have been located outside of the structure. It is suggested that activities concerned with food preparation occurred here, but whether this area is associated with a living structure cannot be determined from the information at hand. Further excavation would be necessary to address this problem.

Lithics

Only four chipped stone artifacts were recovered in association with these features. These consist of a non-dendritic chert Late Prehistoric Period projectile point (Appendix 5) and three non-dendritic chert tertiary flakes. All four artifacts are made from different cores.

Late Archaic Period Level

Evidence of Late Archaic occupation occurred on the ground surface and from buried deposits in Area A (Table 4.12). The surface evidence consisted of a Late Prehistoric projectile point base and a hearth. Test Unit 3 was excavated through a portion of the hearth.

Features

Feature 1 (Test Unit 3) was basin shaped and contained fire-affected rock and charcoal. Flotation and charcoal samples were recovered and submitted for analysis. A radiocarbon date of A.D. 240 ± 140 (1750 B.P. ± 120) was obtained from the charcoal. Seeds, burned wood and fruits were recovered during the flotation analysis (Appendix 4). Charred taxa include povertyweed, seablite, cinquefoil (*Potentilla* sp.), and dock or knotweed (Table 4.13). The remaining specimens are not charred and are probably modern intrusives.

The buried occupation contained two features (Figure 4.12), but not enough charcoal was recovered to provide radiocarbon dates. The presence of a Late Archaic corner notched point (Appendix 5) suggests this level dates to the Late Archaic period.

Feature 1 is a shallow basin-shaped pit containing fire-affected sandstone and a small amount of charcoal. The charcoal was identified as sagebrush.

Feature 2 consists of a cluster of 24 fire-affected rocks and an associated charcoal stain. A few flecks of charcoal were found mixed with the rock. The charcoal stain was located immediately adjacent to the rock and measured about 2 cm thick. Specific

Table 4.12. Summary of archaeological material from the Late Archaic occupation.

Provenience	Artifacts	Features	Radiocarbon Date	Macrofloral Remains	Fauna
Surface (T.U. 3)	Unknown	1 hearth	1250 B.P. ± 120	Seeds, wood, fruits,	--
X.U. 1 Area A	1 point, 4 flakes	25 fire-affected rocks charcoal stain	--	--	1 medium-large mammal, longbone shaft frag. 1 *Spermophilus* sp. right scapula
X.U. 2 Area A	6 flakes	1 hearth, 23 fire-affected rocks	--	--	--
X.U. 3 Area A	1 flake	20 fire-affected rocks	--	--	1 small-medium mammal, longbone fragment

Table 4.13. Summary of macrofloral remains from flotation samples in Feature 1, Area B, 48CR3815.

TAXA	SEEDS/FRUITS	WOOD	COMMENTS
Artemisia tridentata	--	Huge amount	--
Populus sp.	--	Small amount	--
Polygonum or Rumex	11 fruits	--	Slightly charred
Polygonum sp.	4 fruits	--	Not charred, probably obtrusive
Monolepis nuttalliana	2 seeds	--	Slightly charred
Suaeda sp.	1 seed	--	Slightly charred
Atriplex sp.	3 fruit fragments	--	Not charred
Cryptantha sp.	1 nutlet	--	Not charred, obtrusive
Rubus sp.?	1 fruit fragment	--	Not charred
Agropyron sp.	1 fruit	--	Not charred
Potentilla sp.	1 fruit	--	Not charred
Unknown	3 seeds	--	Not charred, possibly aborted Polygonum or Rumex

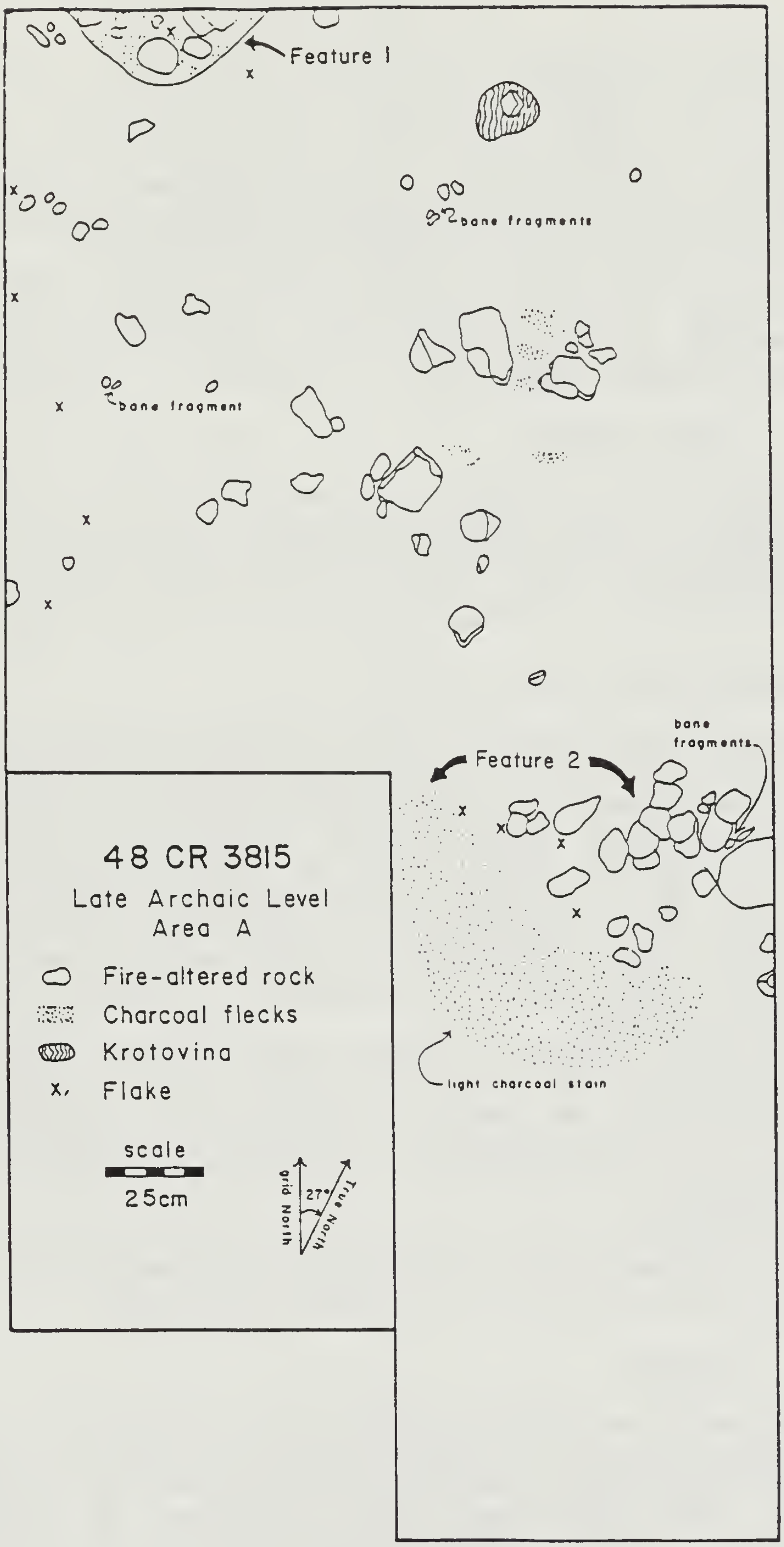

Figure 4.12. Map of the Late Archaic level, 48CR3815.

function of this feature is not known, but it may represent the debris from cleaning out a hearth.

Only the lithics associated with this buried level are included in this discussion. This is because Late Prehistoric, Late Archaic and Middle Archaic artifacts and features occur on the surface and it is difficult to determine association of non-diagnostic artifacts with temporal occupation.

Twelve chipped stone artifacts were recovered (Table 4.14). Only one tool, a projectile point base and midsection, was found. The remainder of the assemblage is composed of quartzite and non-dendritic chert flakes.

Faunal Remains

Faunal material in this level was only noted in Feature 2. Two unidentified mammal long bone fragments and one ground squirrel (*Spermophilus* sp.) scapula were recovered (Appendix 6). One of the long bone fragments shows signs of burning and spiral fracturing. Neither of the other two bones show signs of cultural modification.

Middle Archaic Level (4430 B.P.)

Archaeological materials dating to this time period were found both on the surface and buried in the T2 terrace of Sage Creek east of the present road. The buried material occurred at about 40-50 cm below the present ground surface. The level is dated to 4430 B.P. from a charcoal sample recovered from a feature in Area B, Unit A. It is believed this level may extend further east and south because of the presence of artifactual material and a feature apparently in the same strata in Test Units 2 and 3. This suggestion is tentative in the absence of radiocarbon dates and diagnostic artifacts.

This level contained 22 chipped stone artifacts (Table 4.15). Only debitage was recovered with tertiary flakes comprising the highest portion of the sample. Secondary flakes, primary flakes, and shatter are also present. The sample of artifacts obtained from this level indicates activities associated with core and biface reduction.

Raw materials can all be found at or near the site today. Flakes of non-dendritic chert are best represented (63.6%), with siltstone (22.8%) and quartzite (13.6%) also present.

Features

One feature was located in this level. Feature 1 is a basin-shaped hearth containing fire-affected sandstone and quartzite. Flotation and charcoal samples were recovered and submitted for analysis. Only charred wood from big sagebrush was found during analysis of the flotation sample. A radiocarbon date of 3200 B.C. ± 270 (4430 B.P. ± 230) was obtained from the charcoal in the hearth. This date suggests the site was occupied at the beginning of the Middle Archaic period.

Table 4.14. Summary of lithic artifacts from the Late Archaic Level.

	DEBITAGE			TOOLS	
RAW MATERIAL	PRIMARY	SECONDARY	TERTIARY	POINTS	TOTAL
Non-dendritic chert	1	1	6	1	8
Quartzite		3	1		4
TOTAL	1	4	7	1	12

Table 4.15. Summary of artifacts by unit for the Middle Archaic level, 48CR3815.

RAW MATERIAL	PRIMARY	SHATTER	TERTIARY	SHATTER	TOTAL
UNIT A (Area B)					
Siltstone	-	1	1	-	2
Quartzite	-	1	1	-	2
Non-dendritic chert	1	3	2	-	6
Total	1	5	4	0	10
T.U. 2					
Non-dendritic chert	1	-	-	-	1
Total	1	-	-	-	1
T.U. 3					
Non-dendritic chert		2	3	2	7
Siltstone		1	1	1	3
Quartzite			1		1
Total		3	5	3	11

Early Archaic Period (6570 B.P.)

This level contained archaeological materials located in a silty clay loam approximately 60-85 cm below present ground surface. One radiocarbon date is available and the age suggested for the occupation is inferred from this date and an Early Archaic period projectile point found in the level (Appendix 5). This level was stratigraphically more distinct than the ones above it and was identified as a dark organic stain. Horizontal distribution appears to be limited to the eastern side of the highway in the T2 terrace.

Twenty-two artifacts were recovered from this level (Table 4.16). Non-dendritic chert was the most common raw material recovered. Artifacts of quartzite (14.3%), Morrison quartzite (14.3%), siltstone (9.5%), and dendritic chert (4.7%) were also found. One sandstone metate fragment and a corner-notched Early Archaic period point were recovered. The metate fragment was found adjacent to a modern rodent burrow and its association with this level is questionable.

Four features were found in this level. Based on stratigraphic position, Feature 2 in Test Unit 2 is believed to date to this time period. The feature consisted of a shallow basin shaped hearth with an adjacent scatter of fire-affected rock. This hearth was partially exposed in the cutbank of Sage Creek, and its original size was difficult to determine. The fire-affected rock scatter contained 15 sandstone and three quartzite rocks which may have been removed from the hearth during the site occupation.

Charcoal and soil samples were taken and analyzed. Unfortunately, a radiocarbon date was not obtained because the sample size was too small to provide a reliable age determination. Flotation analysis of the soil sample produced only wood from sagebrush and a single uncharred pigweed (Amaranthus sp.) seed.

Feature 1, in Unit 1, was a small shallow, slab-lined, basin-shaped hearth. Small flecks of charcoal were present, but less than 2 grams were collected, so a radiocarbon date was not obtained. A soil sample was not collected.

Another feature (Feature 1, Unit 3) was an irregular shaped pit filled with burned earth and a very small amount of charcoal. Flotation of soil samples from both outside and within the feature revealed the charred remains of sagebrush. No seeds, fruits or related plant parts were recovered.

The third feature found in this level was noted in Unit 4. This feature was a shallow basin shaped hearth. Small amounts of charcoal and burnt earth were noted in the fill. The small amount of charcoal yielded a radiocarbon date of 6570 ± 130 B.P.. Analysis of a sample of the feature contents produced charred sagebrush wood. No other macrofloral remains were observed.

Paleoindian Level

This level contains nine features and a small amount of associated archaeological materials in a clay loam between 90 and

Table 4.16. Summary of artifacts from the Early Archaic level.

RAW MATERIAL	ARTIFACT TYPE PRIMARY FLAKE	SECONDARY FLAKE	TERTIARY FLAKE	SHATTER	PROJECTILE POINT	METATE	TOTAL
Dendritic chert			1				1
Non-dendritic chert	1	6	3	1	1		12
Siltstone		1		1			2
Quartzite		2	1				3
Morrison quartzite			3				3
Sandstone						1	1
Total	1	9	8	2	1	1	22

140 cm below the present ground surface. Four radiocarbon dates of 9150 B.P., 8780 B.P., 8230 B.P., and 8210 B.P., were obtained from features uncovered during these investigations (Appendix 3). Two of the radiocarbon dates are from two different cultural levels in Test Unit 2, Area B, implying two occupations. These levels were correlated with Paleoindian levels in Area A and the dates averaged together. The two levels are described separately.

Upper Paleoindian Level (8220 B.P.)

Forty chipped stone artifacts were recovered from this level (Table 4.17). Non-dendritic chert is the most commonly occurring material type (40%). Next is quartzite (35%), followed by siltstone (25%). Only one tool was recovered, a quartzite retouched flake. Six features were associated with the upper Paleoindian level. All of these were found in Area B.

Feature 1 was exposed on the eastern side of the road in backhoe trench #1. Because the age of these levels was not known at the time of excavation, horizontal excavation of this feature was not undertaken. Much of the feature was destroyed by the backhoe and only a charcoal sample was removed for a radiocarbon date. This sample yielded a date of 8230 ± 540 B.P. Although a soil sample was obtained, it was used for the sediment analysis and was not floated.

Feature 3 was, the second feature excavated in this level from Test Unit 2 (Figure 4.13). This feature was basin-shaped and contained small pieces of oxidized sandstone and charcoal. Charcoal and soil samples were taken and analyzed. Carbon from the charcoal produced a radiocarbon age date of 8210 ± 260 B.P. Only sagebrush charcoal was recovered from the flotation sample.

Feature 2, in Unit 3, appeared bi-lobed in outline when first uncovered. This condition was first thought to indicate reuse of the feature, but the profile revealed no evidence of a second feature. Only charcoal and burned earth were noted in the fill. No fire-affected rock or oxidation was observed. A charcoal sample was collected, but a radiocarbon date was not obtained. Flotation of a sample of the feature fill produced charred remains of sagebrush (wood), borage (fruit) and Indian ricegrass (seed). A probably intrusive seablite seed was also recovered.

Features 3 and 4 were uncovered in Unit A. Feature 3 was a basin-shaped hearth containing fire-affected rock, charcoal and two flakes. A small amount of charcoal was present, but it was not enough to provide a radiocarbon date. Flotation of a portion of the feature fill revealed the charred remains of sagebrush wood and a chokecherry (Prunus virginiana) endocarp fragment.

Feature 4 appeared as a roughly circular charcoal stain adjacent to Feature 3. This hearth is cylinder shaped, but was deeper and had a flat base. Very little charcoal was observed and a radiocarbon date was not obtained. Flotation of a sample of the fill revealed only the remains of charred sagebrush and Populus sp. wood.

Table 4.17. Summary of artifacts from the upper Paleoindian level.

	ARTIFACT TYPE						
RAW MATERIAL	PRIMARY	SECONDARY	TERTIARY	SHATTER	CORE	RETOUCHED FLAKE	TOTAL
Non-dendritic chert	2	4	8	1	1		16
Quartzite	1	1	10	1		1	14
Siltstone	1	5	2	2			10
Total	4	10	20	4	1	1	40

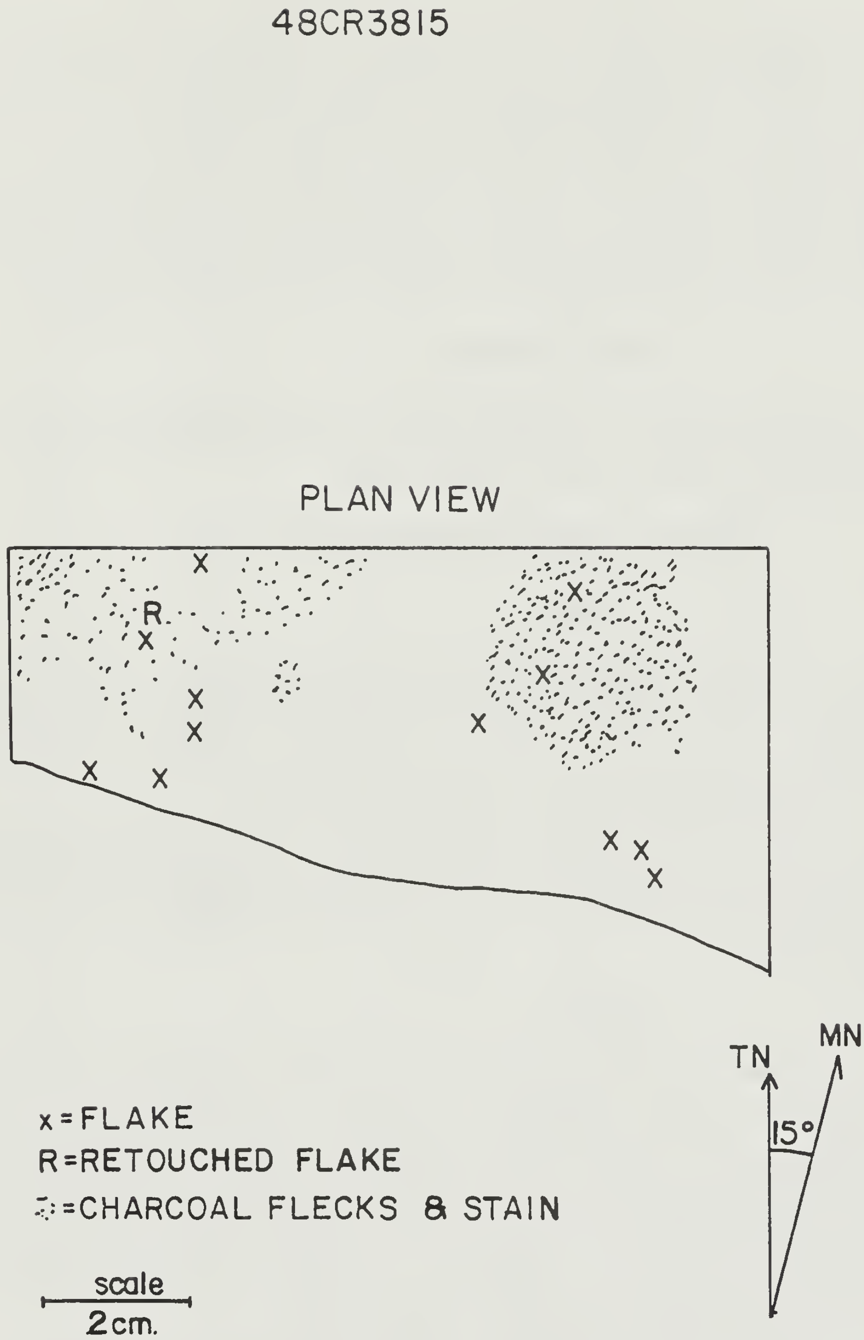

Figure 4.13. Plan view of Feature 3 in Test Unit 2, Upper Paleo-indian level.

The sixth feature excavated from the upper Paleoindian level was found in Unit 6. This feature is roughly circular in outline and the fill contained small flecks of charcoal, burnt earth, and small fire reddened pieces of sandstone. Insufficient charcoal was present to provide a radiocarbon date. Flotation of a sample of the fill and a soil sample located outside the feature revealed few macrofloral remains. Charred sagebrush, a Populus bud bract and an uncharred saltbush seed fragment were recovered from the hearth fill. The saltbush seed fragment was probably intrusive.

Faunal Remains

Faunal material was recovered in Test Unit 2, level 6. Three unidentified bone fragments were collected (Appendix 6). No signs of cultural modification were noted.

Lower Paleoindian Level (8965 B.P.)

Lithics

This level contained 36 lithic artifacts. These were found in Areas A and B, which may have been different activity areas (Table 4.18). In both areas, unutilized debitage dominates the assemblage. Only one tool, a stemmed biface, was collected. No tools were found in the Area B excavations.

Non-dendritic chert dominated the raw material assemblage in both areas. Quartzite and bioclastic chert are also represented in both areas but comprise a small percentage of the total assemblage. Only one siltstone artifact was found and it is the only tool from the level.

Features

Three features date to the lower Paleoindian level, one in Area A and two in Area B. In Area A, Feature 2 was uncovered in Units 2 and 3 (Figure 4.14). This feature was a small cylindrically shaped hearth containing burnt earth and charcoal. A sample of charcoal was collected and submitted for a radiocarbon age determination and a date of 9150 ± 810 B.P. was obtained. A sample of the fill which was floated was found to contain a small amount of macrofloral remains. These included charred sagebrush wood and chokecherry fruits (Appendix 2).

The first feature uncovered in Area B, apparently dating to the lower Paleoindian level, was noted in backhoe trench 1 (Feature 2). Although a radiocarbon date was not obtained from this feature, stratigraphically it lies below the Feature dated at 8230 B.P., and should date to the lower level. This feature was almost obliterated by the backhoe and only a small soil sample could be obtained. This soil sample was utilized in the sediment analysis described in Appendix 1.

The final feature dating to this level was a small amorphous charcoal stain approximately 2-4 cm thick in Test Unit 2. A

Table 4.18. Summary of artifacts by area from the lower Paleoindian level.

RAW MATERIAL	ARTIFACT TYPE PRIMARY	SECONDARY FLAKE	TERTIARY FLAKE	SHATTER	CORE	BIFACE	TOTAL
Area A							
Non-dendritic chert	2	7	6	2	1		18
Quartzite			2				2
Bioclastic chert		2					2
Siltstone	1					1	2
Total	3	9	7	2	1	1	24
Area B							
Non-dendritic chert	1	2	4	2			9
Bioclastic chert		1					1
Quartzite		1		1			2
Total	1	4	4	3			12

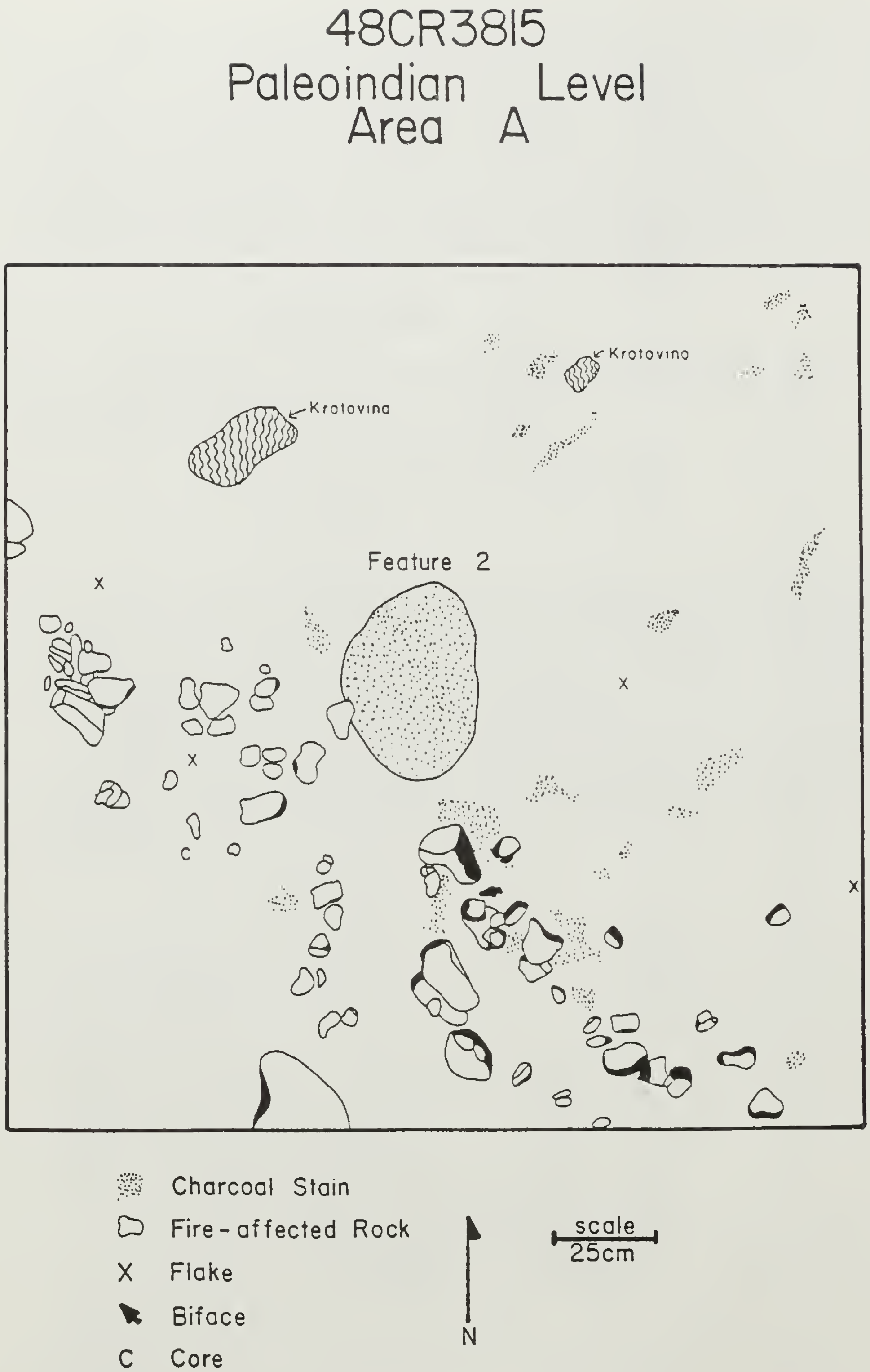

Figure 4.14. Map of lower Paleoindian level in Area A.

charcoal sample was taken which produced a radiocarbon date of 8780 ± 260 B.P.

Faunal Remains

One faunal element, a vertebrae from a rattlesnake, was recovered from this lower level in Test Unit 2 (Appendix 6). Evidence of cultural modification was not observed and the element may be intrusive.

Archaeological Materials Not in Dated Levels

Unit A in Area A was placed over a feature noted in backhoe trench. 2. Stratigraphically this feature could date to either the Late or Middle Archaic periods. These materials were analyzed similarly to the other cultural materials and were described as a group. However, they are not used in temporal comparisons.

Lithics

Thirty chipped stone artifacts were recovered from this level (Table 4.19). Non-dendritic chert is the most common raw material type (60%). Siltstone (16.7%), quartzite (13.3%), bioclastic chert (6.7%), and algalitic chert (3.3%) were also noted in the collection. The assemblage is comprised entirely of debitage.

Features

One feature was located in this unit. Because most of the feature was destroyed by the backhoe bucket, only a remnant of a possible basin shaped rock lined hearth remained. The remaining fill contained sandstone and quartzite fire-affected rocks and small amounts of charcoal. Insufficient charcoal was present to provide a radiocarbon date.

Faunal Remains

Seven bones and bone fragments were found in Test Unit A (Appendix 6). Only one bone could be identified to genus and is a right scapula of a ground squirrel. Three vertebrae fragments, one rib fragment, one long bone fragment and one unidentified bone fragment were also recovered. However, these could not be identified beyond the family level. A single element, the long bone fragment, showed evidence of cultural modification. The spiral fracturing and burning might indicate the bone was from an animal used for food.

Table 4.19. Summary of artifacts from Unit A, Area A, 48CR3815.

	ARTIFACT TYPE					
RAW MATERIAL	PRIMARY	SECONDARY FLAKE	TERTIARY FLAKE	SHATTER	CORE	TESTED COBBLE	TOTAL
Non-dendritic	1		13	3		1	18
Algalitic chert		1					1
Siltstone	1	1	1	1	1		5
Quartzite		3		1			4
Bioclastic chert		1	1				2
Total	2	6	15	5	1	1	30

CHAPTER 5
INTERPRETATIONS
William R. Latady, Jr. and David G. Eckles

A series of research topics was presented in Chapter 2 to be addressed using information gathered during the field investigations and laboratory analyses. The following chapter describes the laboratory procedures employed during the analytical phase and presents the contributions this information has made to the research objectives.

Laboratory Procedures

Artifacts collected were classified by raw material and artifact type. These are described in Appendix 7. Microscopic investigations of wear patterns or other diagnostic studies were not attempted. The presence or absence of edge modification was noted with the aid of a 10x hand lens.

Information on lithic assemblages was entered into the Cyber 730 and 760 computers at the University of Wyoming. SPSS (Statistical Package for the Social Sciences) procedures were used to describe and analyze assemblage attributes. Fortran and IGL (Interactive Graphics Library) procedures were used to analyze the spatial distribution of flake/tool types and raw material types at 48CR3812, 48CR3814 and 48CR3815.

Fauna

Analysis of faunal elements from archeological sites can provide information concerning subsistence strategies of the prehistoric inhabitants. If species are present that are known to have a discrete birthing period, it might be possible to infer seasonality of site occupation (e.g. Frison and Reher 1970; Reher 1970, 1973, 1974).

Faunal material was recovered only from 48CR3815. All of the material was identified through comparison with the University of Wyoming faunal collections. Unfortunately, the fragmentary nature of the sample did not permit identification beyond the generic level and often not below class.

Two types of bone modification attributable to human action were observed. The first is burning, probably a result of cooking. The second is spiral fracturing. This condition could indicate the bone was broken while green for marrow extraction, tool manufacture or during dismemberment (Binford 1981).

Discussion

Chronology

Although Paleoindian to Late Prehistoric Period components were sampled, a complete chronological sequence was not derived for the Sage Creek Basin. Overall, projectile points recovered resemble types established for the Northwestern Plains (Frison 1978). However, most of the projectile points found during the course of this project were on the surface so their utility, except as indicators of site use, was limited. Points found in apparent association with buried dated features did not always resemble their diagnostic counterpart on the Plains.

Environmental reconstruction undertaken at the Sage Creek Site, 48CR3815, suggests a sequence of deposition similar to that postulated for the Northwestern Plains (Reider 1980, 1983). These episodes cannot be directly correlated to climate, so conditions in the Sage Creek Basin may have been quite different at any given time then on the Northwestern Plains.

Certainly the assemblages from each level indicate a stable environment or at least reuse of the area for the same reasons. Tool diversity is low and raw material types, almost without exception, can be found on or within a kilometer of the site. However, factors such as sample bias may be responsible for this view.

Subsistence Patterns

Flora and Fauna

Faunal remains occurred only at 48CR3812 and 48CR3815. A sample of 28 bones or bone fragments from rodents, snakes and various sized mammals was recovered. Only one bone showed any direct evidence of cultural modification. This small number of faunal remains implies that hunting was not an important activity at this site.

Sampling of the modern plant communities at 48CR3815 shows that edible taxa are available in limited quantities throughout the year (Table 5.1). Plant resources available during late spring and early summer include taxa used as greens and pot herbs, as well as bulbs and tubers. Plants available are wild onion (*Allium textile*), mountain springparsley (*Cymopterus montanus*), and the spring shoots of cattails and saltbushes.

Ripening seeds and fruits during mid to late summer constitute another set of resources. Wheatgrasses (*Agropyron smithii* and *A. spicatum*), wildrye, saltbush and plains pricklypear become available. Edible resources are concentrated on these plants and there may be less energy expended in procuring the resource than is needed to obtain the edible plant parts available during spring.

Finally, fruits, seeds, and one rootstock, which occur in late summer and early autumn, can be used. These resources include western snowberry (*Symphoricarpos occidentalis*), plains pricklypear seeds and cattail roots. Cattail roots are available year round

Table 5.1. Seasonal availability of edible plants recorded at 48CR3815.

TAXA	EDIBLE PART	SEASON
Agropyron smithii	seeds	mid-summer
A. spicatum	seeds	mid-summer
Allium textile	bulb	late spring
Atriplex spp.	seeds	late summer-autumn
	greens	spring
Cymopterus montanus	tuber	spring
Elymus sp.	seeds	mid-summer
Opuntia polyacantha	fruit	late summer
	seeds	late summer-autumn
Symphoricarpos occidentalis	fruit	late summer-autumn
Typha latifolia	roots	all year
	greens	spring
	flower	early summer

and can be harvested at anytime, but are particularly nutritious after the first frost (Linde et al. 1976:18-20).

Edible plant densities from 48CR3815 are presented in Table 5.2. They are used here as a means of quantifying their relative abundance to provide additional insight into potential plant use.

Grasses producing edible seeds constitute the major edible resource in terms of plant number per square meter. However, wheatgrasses often reproduce vegetatively and do not always produce seeds. Despite the high relative density of this genus, it may not have been especially productive.

Although seed plants such as saltbush and pricklypear are not nearly as abundant as grasses, they may have been a more important edible resource. The seeds of both plants, but particularly saltbush, occur in large numbers on each plant and could have been gathered in a relatively short period of time. Yanovsky (1936:21) and Steward (1938) report that seeds from saltbush were ground into meal and used for pinole or eaten dry.

Out of 36 plants noted during the study of the modern vegetation at the McKean site, nine are potential edible resources. All of these are available between late spring and early fall with cattails available throughout the year. Based on plant availability and density, two general periods of site occupation are inferred, late spring-early summer and late summer-early fall.

Artifacts and recovered macrofloral remains in the upper levels of 48CR3815 suggest a summer occupation when edible seeds are present. Earlier occupation of the site may have occurred later in the summer or during autumn when berries become available. This evidence certainly does not rule out a spring occupation, or even a winter use, since plant resources available during these seasons (e.g. bulbs or tubers) would not be likely to leave evidence of having been consumed.

While edible plant resource densities in the site area itself are low when compared with other archaeological sites in Wyoming, five broad vegetation zones exist within a 2 km radius (Department of the Interior 1978). Persons ranging out from 48CR3815 would have access to both foothills and cool desert plant resources. If future archaeological investigations are conducted at 48CR3815, then these zones should be sampled. This data could then be used to operationalize hypotheses concerning the importance of edible plants to the prehistoric residents of this area.

Floral remains were recovered from hearths at 48CR3812, 48CR3814 and 48CR3815. Only charred remains are included in this analysis because uncharred seeds or fruits are probably modern contaminants. Preserved floral remains can be divided into two groups: 1) wood used for fuel; and, 2) seeds or fruits.

Charred wood appeared in all of the hearth samples. Taxa observed included big sagebrush, juniper and cottonwood. Their presence probably indicates these taxa were when the sites were in use and except for juniper, these taxa can be found in the same areas today. The presence of juniper is surprising since it is not present at or near 48CR3814. In fact, according to a vegetation map compiled by the Department of Interior (1978), the closest known juniper stand is about 22 km southwest of the site. Modern land use patterns, possible climatic shifts, or the lack of

Table 5.2. Density of edible plants within each community.

Community and Plant	Frequency		Density/m^2
MIXED DESERT SHRUB			
Opuntia polyacantha	3		1.5
Symphoricarpos occidentalis	1		.5
		TOTAL	2.0
GREASEWOOD-BLUEGRASS			
Atriplex sp.	8		1.6
GREASEWOOD-SAGEBRUSH			
Agropyron smithii	388		77.6
Atriplex sp.	1		.2
Opuntia polyacantha	1		.2
		TOTAL	78.0
SAGEBRUSH-WHEATGRASS			
Agropyron smithii	230		46.0
Elymus sp.	1		.2
Cymopterus montanus	1		.2
Allium textile	1		.2
		TOTAL	46.6
RIPARIAN			
Agropyron sp.	64		12.8
Typha latifolia	2		.4
		TOTAL	13.2

floristic studies in the Sage Creek Basin might be responsible for apparent low juniper populations.

The low numbers of preserved seeds and fruits recovered do not support inferences of intensive plant gathering and processing at these sites. Non-cultural sources for the presence of these taxa in hearths include prehistoric seed rain (Minnis 1981), the seed bank in the soil and possibly the use of animal dung (such as bison) for fuel.

At 48CR3815 features in the Late Prehistoric and lower Paleoindian levels contained sufficient floral remains to suggest their use as food. Feature 1, in the Late Prehistoric level, contained considerably higher numbers of floral remains than reported from most sites in southern Wyoming. The presence of goosefoot and poverty weed seeds, both important prehistoric edible plants (Steward 1938), might imply plant processing occurred around the feature. Additional support for this inference comes from the occurrence of a broken metate adjacent to this feature.

Charred fruits of chokecherry were recovered from a feature in the lower Paleoindian Level. Chokecherries were widely used prehistorically and were eaten raw or ground and mixed with meats (Harrington 1967; Grinnell 1972; Steward 1938). Although not present on the site today, they are found throughout Wyoming and presently may occur fairly close to the site.

Plant remains may also indicate seasonal use of a site, but any inferences of seasonal site use are subject to the constraints noted above. The few macrofloral remains recovered from the sites generally suggest a summer occupation.

At 48CR3815, excavation of dated features presents a comparison of seasonality between levels. Most of the macrofloral remains recovered indicate use of the site at some point during the summer months. Features dated to the Late Archaic and Late Prehistoric Periods contained seeds which are available during mid to late summer. Charred chokecherry fruits from the lower Paleoindian level indicate a late summer to early fall occupation. Another possibility is that the chokecherries were harvested then dried whole for winter use (Harrington 1967:256). If this occurred at 48CR3815 then a winter occupation is possible.

The presence of a cottonwood or aspen (_Populus_ sp.) bud bract in a feature stratigraphically dated to the upper Paleoindian level implies a spring use of the site. It is possible these features represent two different seasonal occupations of the site during Paleoindian times. A shift to a summer use of 48CR3815 may have occurred between 8,000 and 5,000 years ago.

Features

Hearths were located at all four sites during this project. At three sites, 48CR3812, 48CR3814 and 48CR3815 at least a sample of the features noted, were excavated.

Twenty-six hearths or hearth-like remnants were excavated during the course of this project. All but four were uncovered at 48CR3815. One was excavated at 48CR3812 and three from 48CR3814.

It was hoped that through an examination of attributes observed in these features, suggestions concerning their past uses could be made.

Three feature types were found during this project: basin, cylindrical, and circular/amorphous. Basin shaped pits may be described as round or oval in diameter with a rounded bottom sloping gently up to the edges of the pit. Cylindrical pits are characterized by reasonably straight walls and flat to gently curving bases. Circular/amorphous refers to those features which are oval to circular in outline, but are only a few centimeters deep.

The basin shape is the most commonly occurring morphological hearth type found along the Sage Creek road. Most of the features excavated from the surface were basin shaped and only one did not contain fire-affected rock. Only two hearths were cylindrical in shape. Both were found in the two Paleoindian levels. One fire-affected rock was recovered on top of one these hearths. No oxidation was present in either feature.

Six features are described as circular/amorphous. One was found at 48CR3814 in apparent association with a basin shaped hearth. The remaining five features were found at 48CR3815, two in the Late Prehistoric level, one in the Late Archaic level and two in the lower Paleoindian level. Fire-affected rock was recorded in the circular/amorphous feature from the Late Archaic and Late Prehistoric levels.

The presence of fire-affected rock in basin shaped hearths might indicate these features were used for cooking. Hough (1926:40-43) describes two different types of cooking activities in the ethnographic literature: stone boiling, and steaming or baking.

Stone boiling requires a pit lined with a green hide. The hide is filled with water and gradually brought to a boil by the addition of heated stones. If a paunch was used, it was suspended above the ground with a tripod or stick framework. It was then filled with water and hot rocks added to bring the contents to boil (Hough 1926:41).

Baking or steaming food is done by heating rocks in a fire, then transferring them to a prepared pit. Leaves or grass are placed over the hot rocks and the food placed on the plants. Additional vegetation is used to cover the food and soil added to cover the pit. The pit must be partially cleaned out when the food is cooked and if the pit is reused, then all of the contents have to be removed (Hough 1926:42-43). It is expected that around hearths used for steaming or baking, amorphous charcoal stains with or without fire-affected rocks might be present. Steaming or baking pits might also be larger and deeper than other hearths.

The presence of fire-affected rock and charcoal or ash deposits in close association with several hearths was reported for both 48CR3814 and 48CR3815. These may represent clean-out of the hearths prior to their reuse. It is also possible that the two cylindrical hearths recorded in the Paleoindian levels were used for baking purposes.

If baking did occur at these sites, then plants probably comprised an important portion of the prehistoric diet. In a survey of ethnographic literature, Guernsey (1984) reports that baking pits were used primarily to cook vegetables. Almost all roots and tubers were cooked in this manner, as were corn and mescal crowns in the southwestern United States (Castetter and Opler 1936). Meat was generally boiled or roasted, although small animals, such as squirrels or rabbits, were baked (Opler 1941).

Other uses for hearths include hide or meat smoking, heat, light, stone tool manufacture and religious contexts (Guernsey 1984). Six hearths were recorded which did not contain fire-affected rock. It is inferred these pits may have functioned in one or more of the above categories.

Chapman (1980) suggests "commensal groups", the smallest food sharing group of individuals, require a minimum distance of four or five meters between hearths. Those areas exhibiting less space between firepits may indicate reoccupation (Chapman 1980:140-144). In only two instances was this phenomena noted between two apparently contemporaneous and morphologically similar hearths at 48CR3815. These are Features 3 and 4 in the upper Paleoindian level and Features 1 and 3 in the Late Prehistoric level. In the absence of an exact dating method, contemporaneity is difficult to determine. However, other explanations are plausible and include regional and temporal variation between sites in Wyoming and Archaic sites in the southwestern United States. In addition, different functions or subsistence strategies may require different distances between hearths.

Shattered rocks found in an archeological context might represent the by-products of stone boiling activities (Vehick 1977:171; Hough 1926). In this process, stones were located in a fire and subsequently placed into a vessel containing water. Lliff (1954:195) reports that when stone boiling occurred, the stones often broke or shattered when placed into the vessel. Binford (1978:159) notes that these rocks were removed from the vessel and discarded. It is possible that the large quantities of broken and shattered fire-affected rocks recorded at 48CR3812 and 48CR3815 represent the remains of stone boiling activities. These activities could have been the product of meat or vegetable preparation or bone grease manufacturing.

Settlement Patterns

Site Structure

The internal structure of 48CR3815, 48CR3814 and 48CR3812 was studied in an attempt to locate activity areas and evidence of reoccupation.

48CR3812

No discrete clusters of artifact types were observed, although flakes seemed to be more prevalent north of the datum (Figure 5.1).

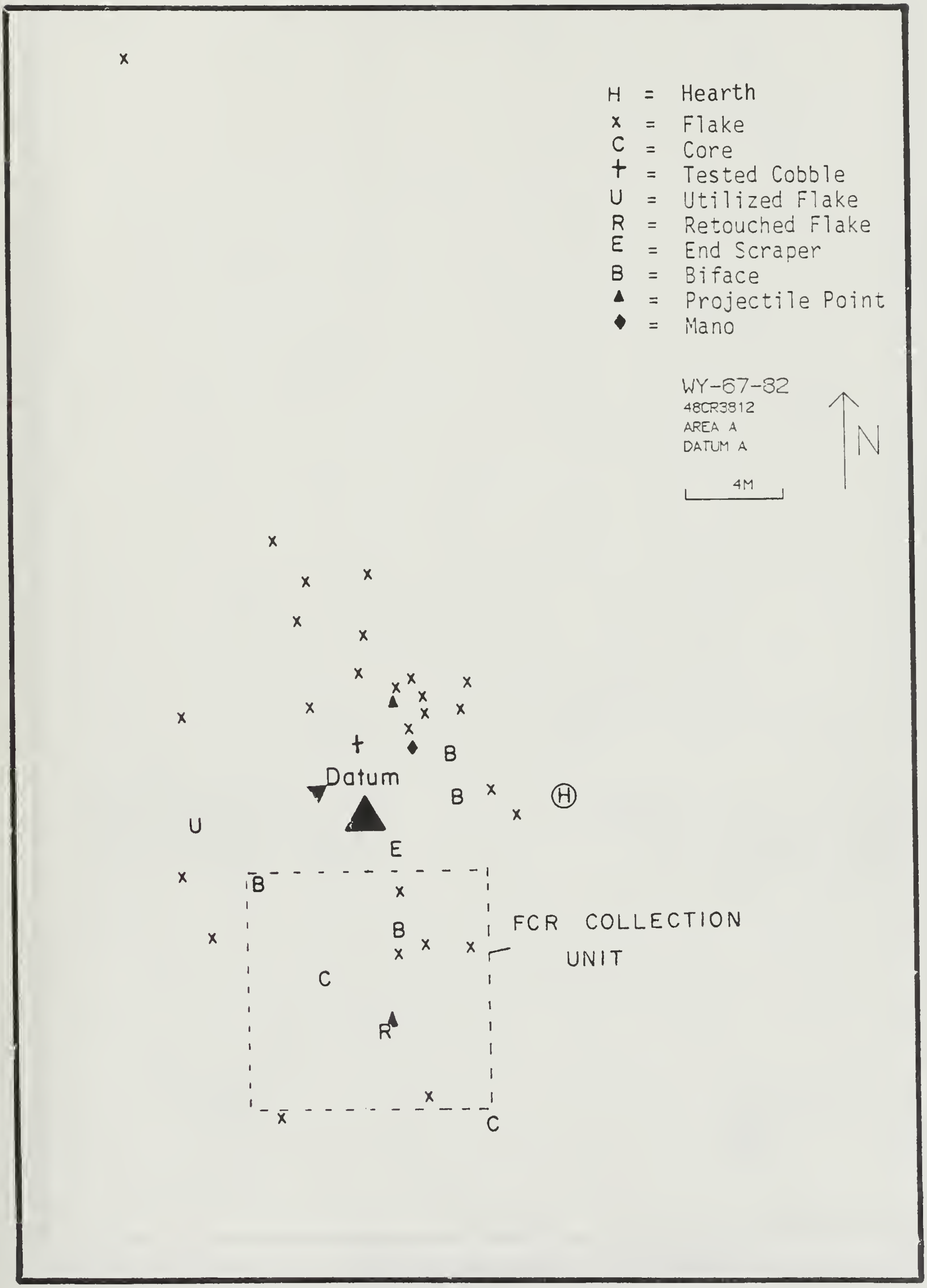

Figure 5.1. Plot of artifact types.

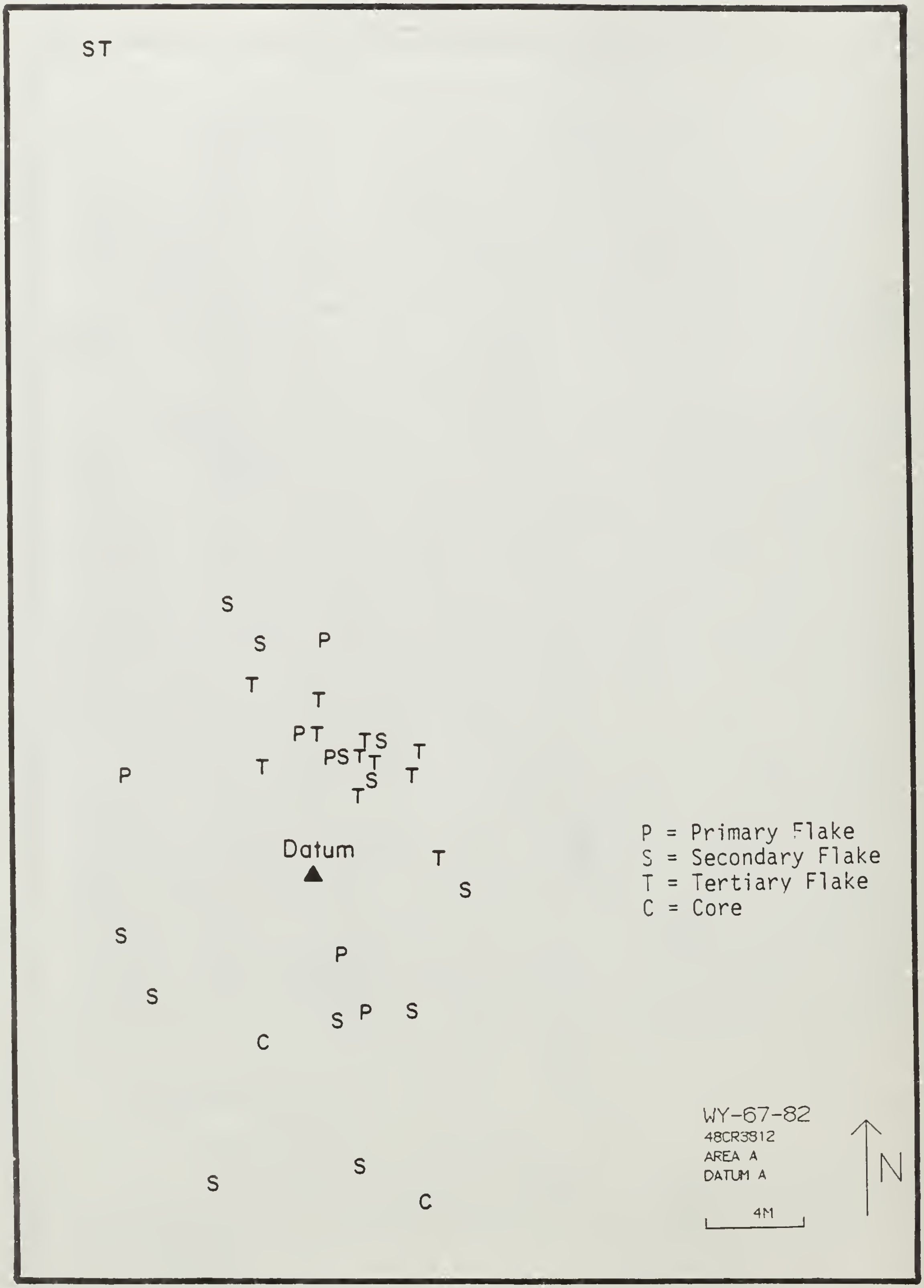

Figure 5.2. 48CR3812, plot of debitage types.

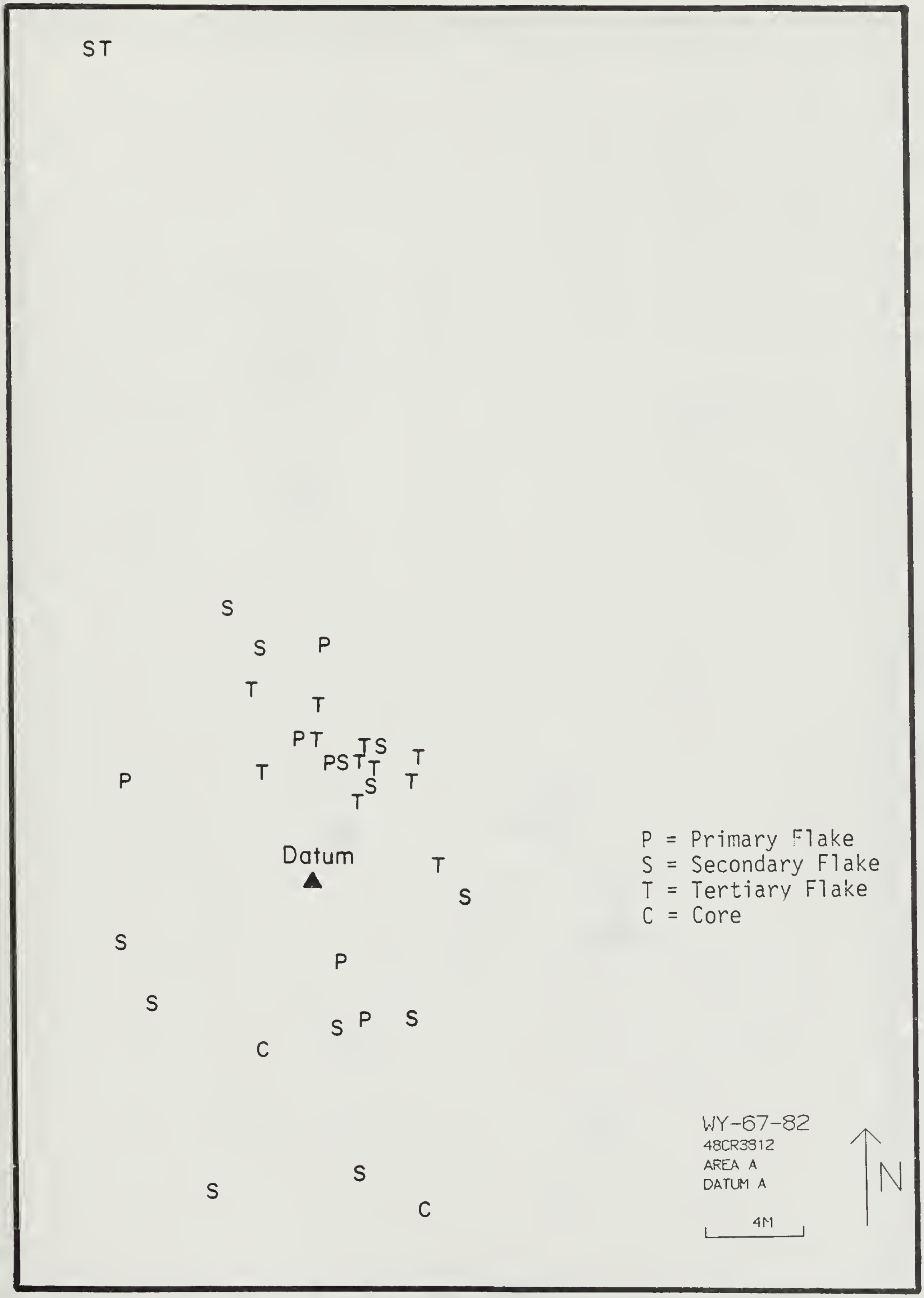

Figure 5.2. 48CR3812, plot of debitage types.

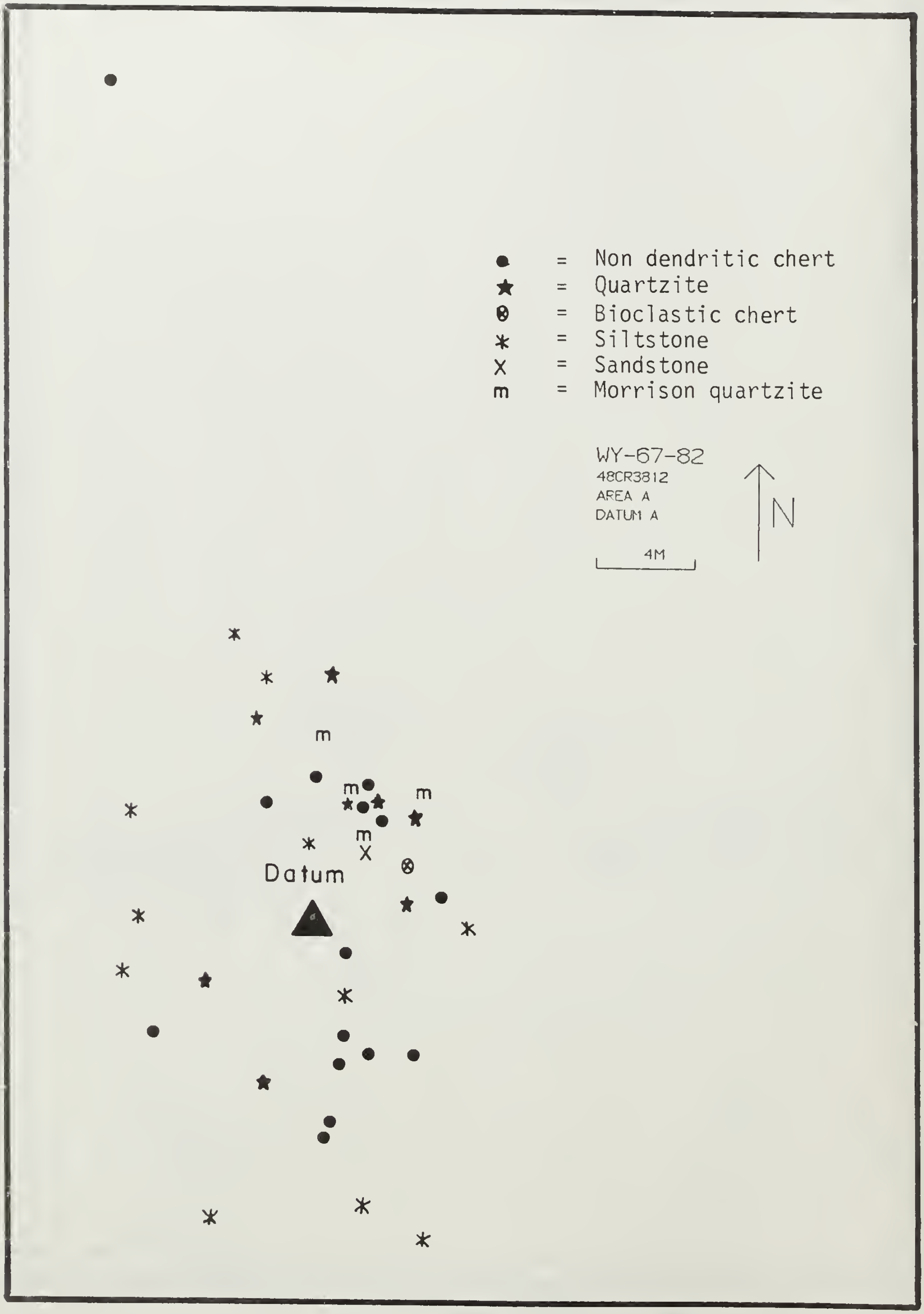

Figure 5.3. 48CR3812, plot of lithic raw material types.

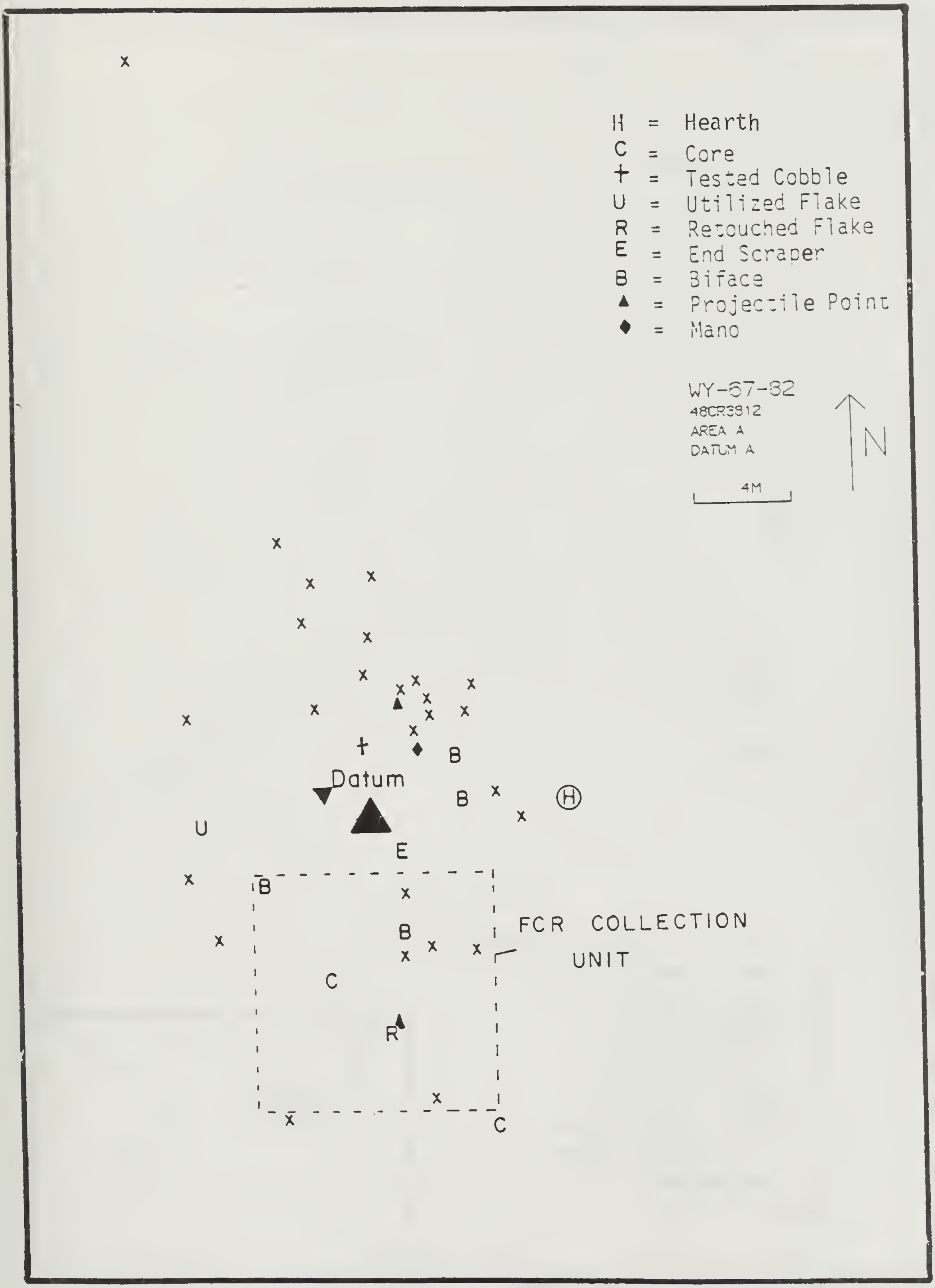

Figure 5.4. 48CR3812, distribution of tools in relation to fire-affected rock and Feature 1.

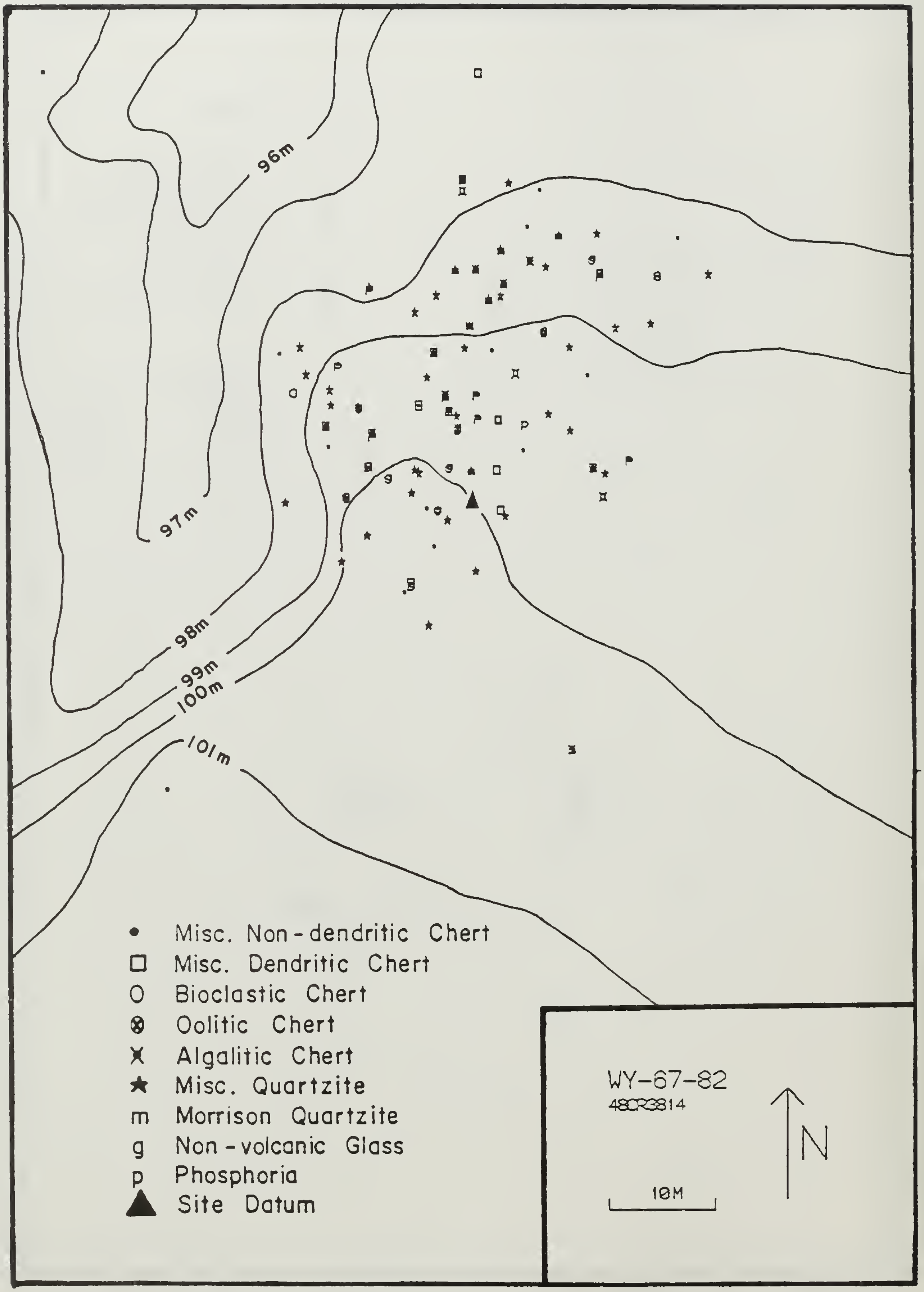

Figure 5.5. 48CR3814, I.G.L. plot of lithic raw material distribution.

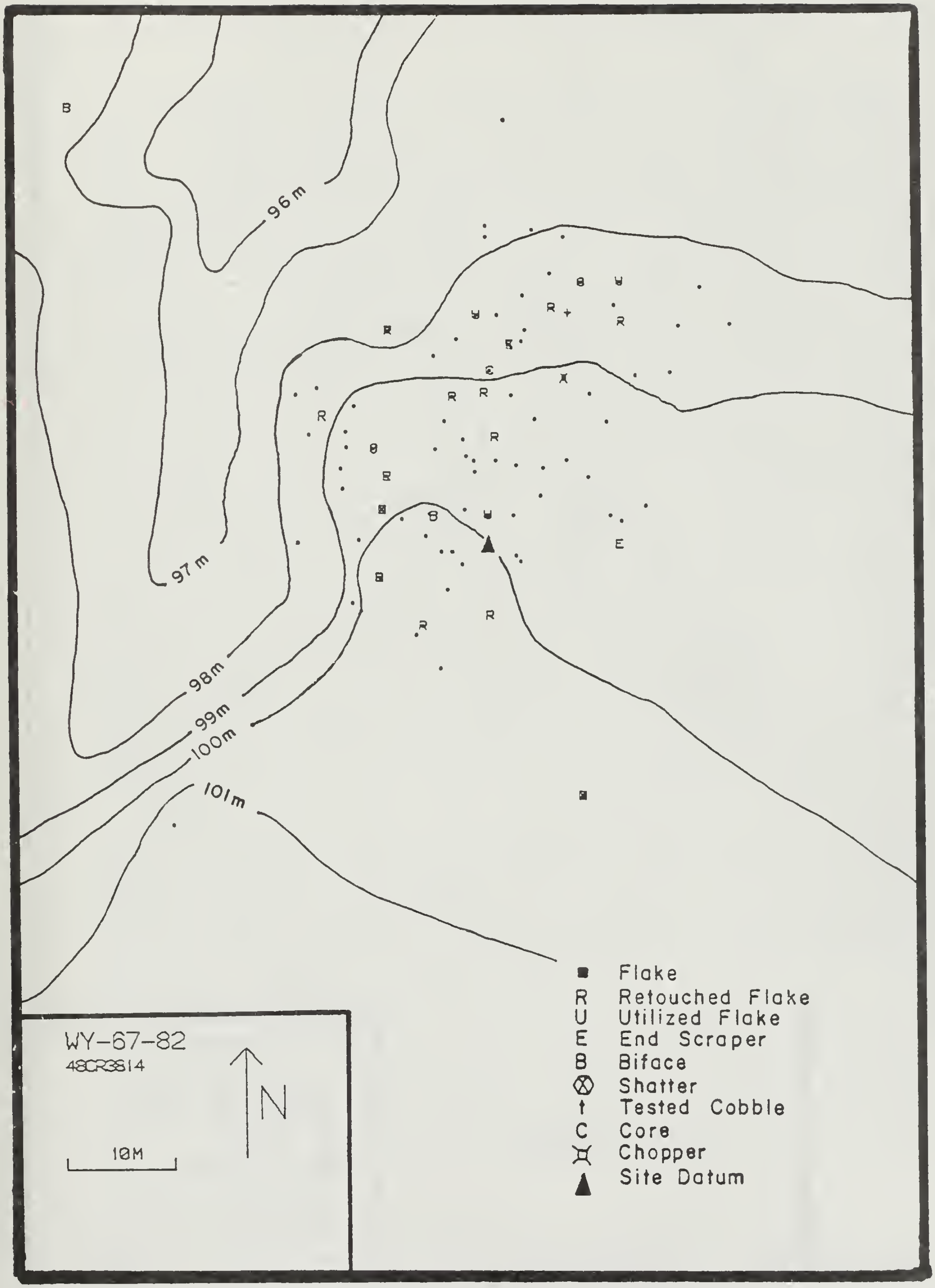

Figure 5.6. 48CR3814, I.G.L. plot of artifact distribution.

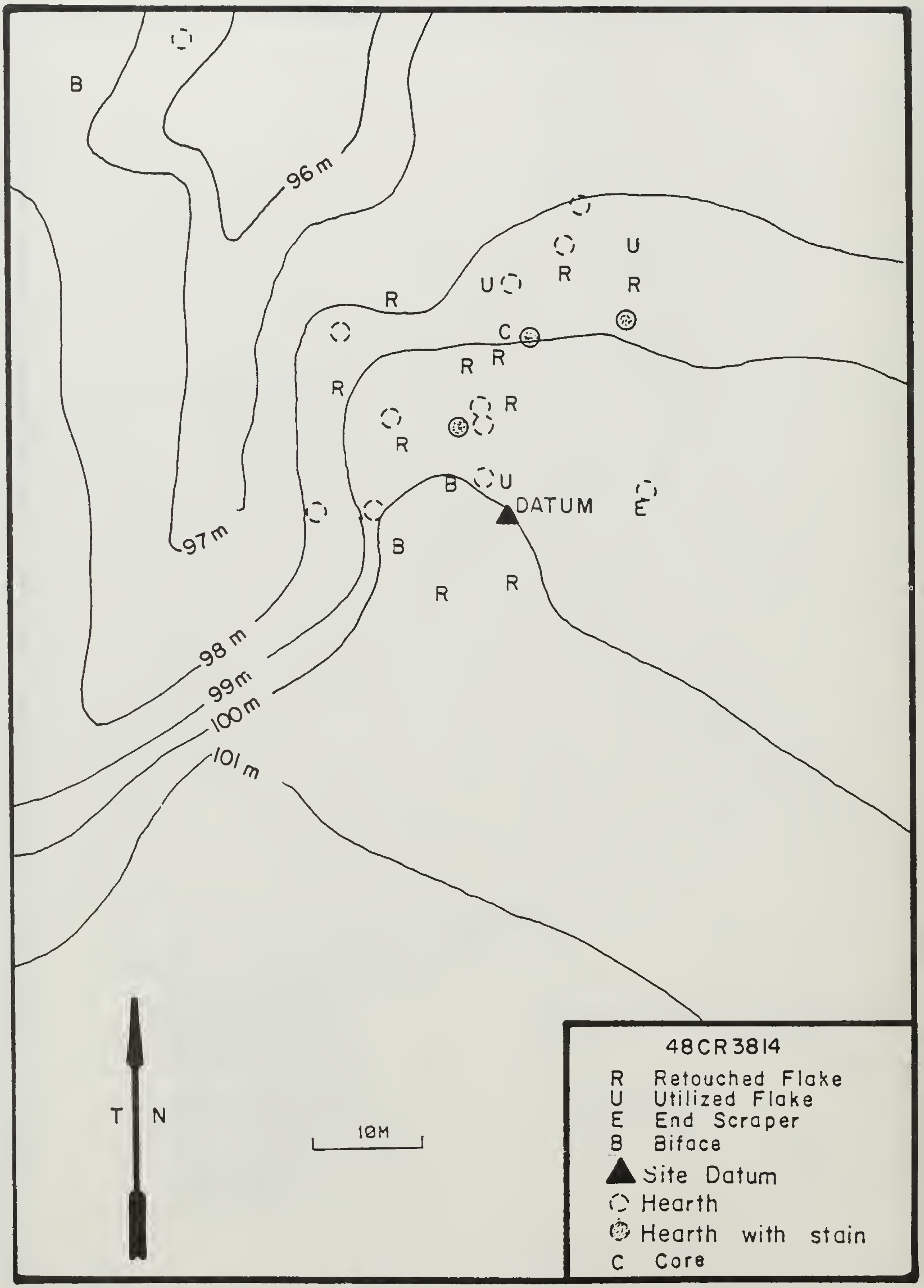

Figure 5.7. 48CR3814, plot of tool proximity to hearths.

48CR3815

At 48CR3815, visual inspection of the artifact distribution plot indicates there are a number of artifact clusters (Figure 5.8). Six areas, delineated in Figure 5.8, may be activity areas. Area I contains tools and debitage in close proximity to the highest densities of fire-affected rock. Circular arrangements of debris, representing a number of activities, are often found ethnographically (Binford 1983:150; Yellen 1977:113-130). The presence of non-dendritic chert cores and primary reduction flakes (Figures 5.9 and 5.10) suggests that at least the early stages of tool production occurred here. Other activities which may have occurred in this area include tool sharpening and seed grinding.

The only definite pattern noted in the overall spatial distribution of the fire-affected rock is that unit 4 contains the highest frequency of shattered, reddened and broken rock (Figure 4.9). Units 1 and 5 also contain fairly high numbers of rocks. The possibility that this distribution is due solely to environmental processes seems remote since the units downslope from unit 1 contain low rock frequencies (Figure 5.11).

The individual grid unit maps were redrawn to form a contour map of the sampling area. Total numbers of rocks were counted in each of the 500 adjacent 1 x 1 m units. An arbitrary interval of four rocks was used to construct the contours (Figure 5.12). There are three areas of rock concentration within the sample area, one each in units 1, 4, and 5 (Concentrations A, B, and C). These concentrations may represent activity differences between areas and might involve morphological differences in the types of features used for plant of animal processing or preparation. These clusters may also reflect greater reutilization of rocks in different areas of the site.

Between 72 and 85 percent of the fire-altered rock noted in each of the units occurred as shatter. Frequencies this high would seem to indicate that stone boiling was the preferred cooking process at 48CR3815 (see Vehik 1977). Comparison between the four concentrations indicates shattered rock occurs less frequently within concentration C and most frequently in concentration A. Reddened and broken rocks occur most often in concentration C and least often in concentration B.

Mean weight of each rock type was calculated and graphed for the units 1, 4, and 5 in order to compare the concentrations (Figure 5.13). In units 4 and 5, small rocks, not surprisingly, tend to have lower mean weights. However, in unit 1, reddened rocks have a lower mean weight than either shattered or broken rocks. Whether this reflects reuse, geological processes or functional differences is difficult to determine due to the sampling process.

Artifact concentrations are not any higher within the collection areas than in other parts of the site. This may be the result of erosional processes where the smaller and lighter chipped stone tools and debitage have eroded downslope.

Area II in Figure 5.8 appears as a single artifact because the other 22 artifacts were recorded with a Brunton compass and tape. Sub-datum B-2 was established and 21 pieces of debitage, one

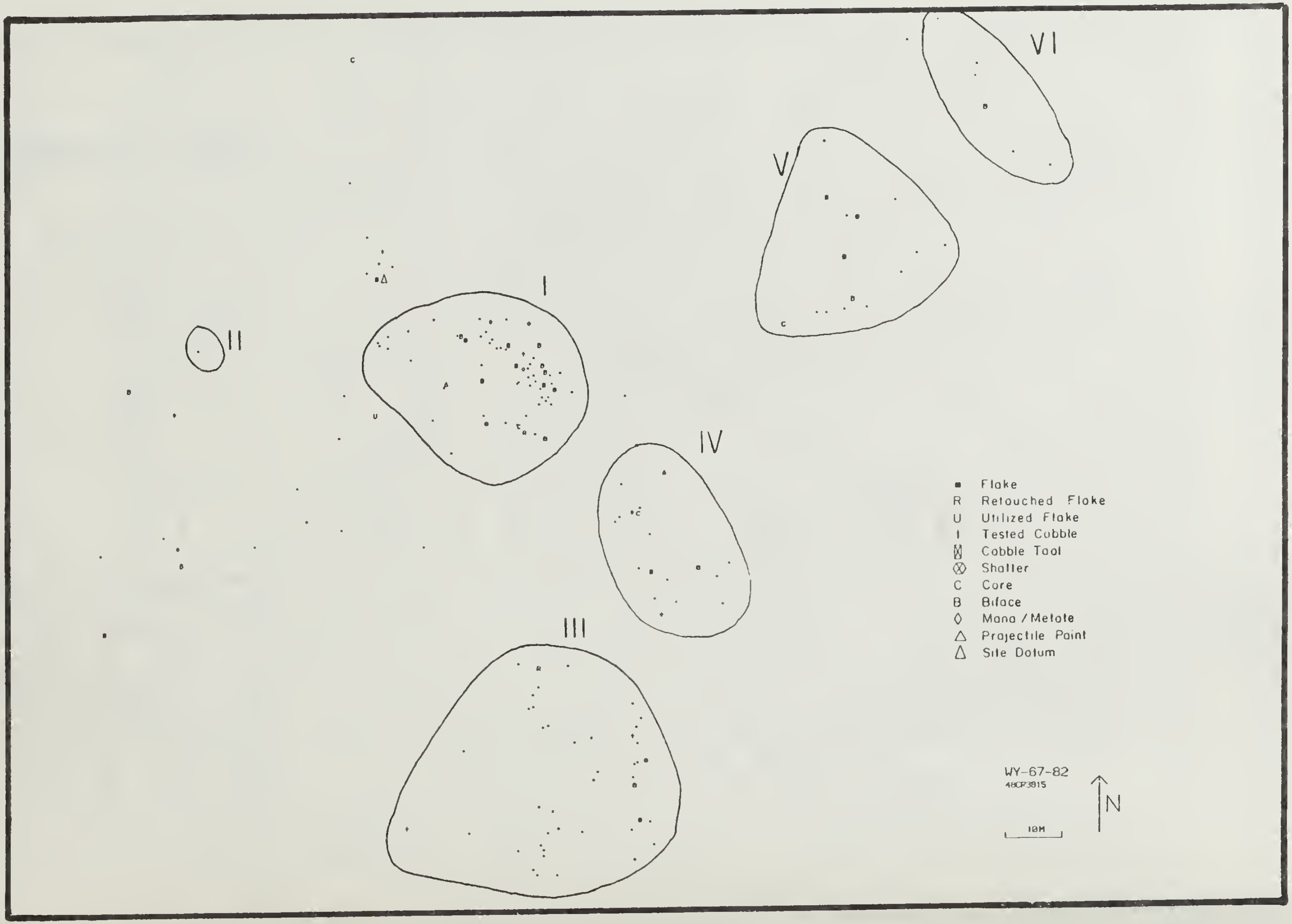

Figure 5.8. 48CR3815, plot of artifact distribution.

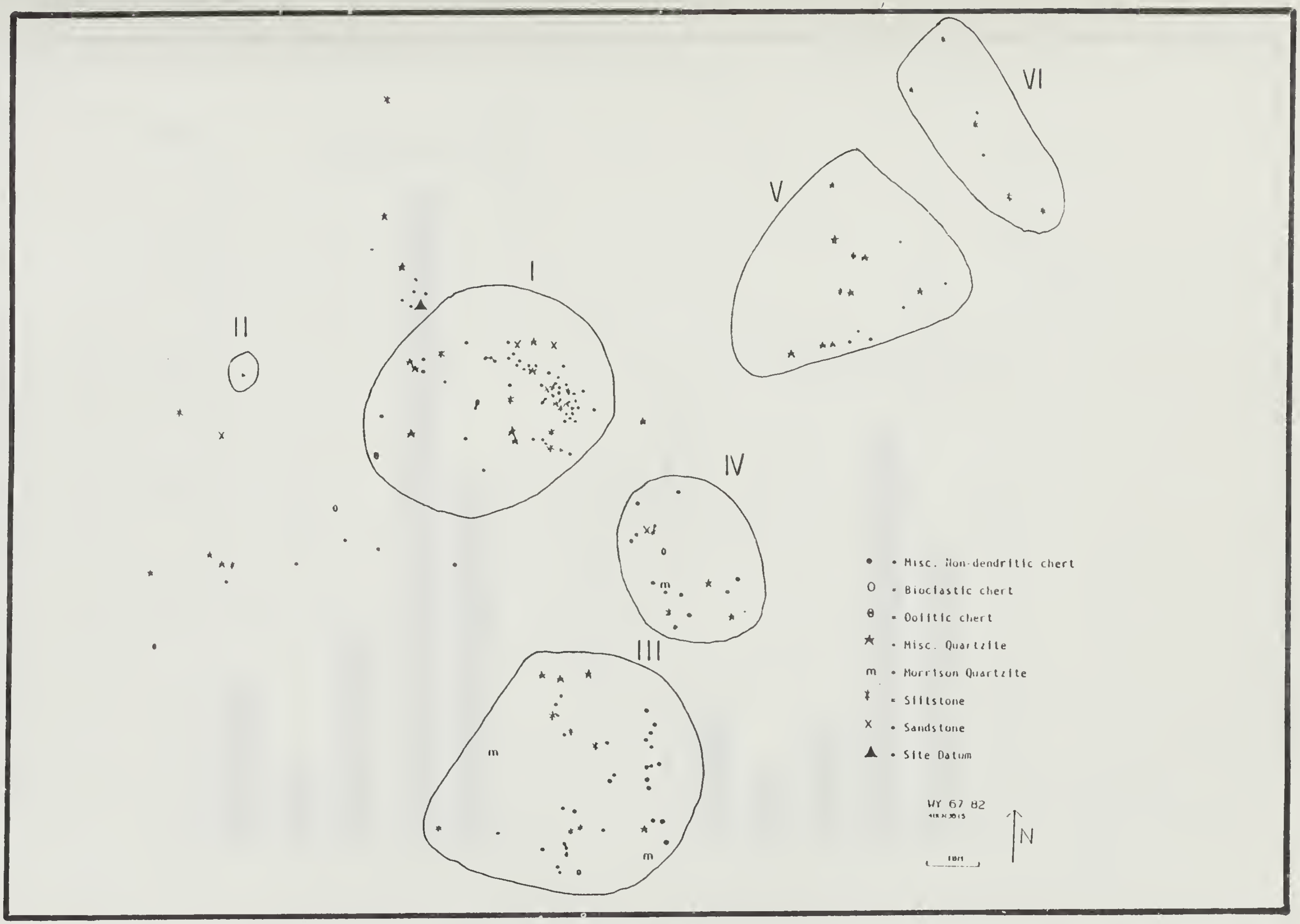

Figure 5.9. 48CR3815, plot of raw material types.

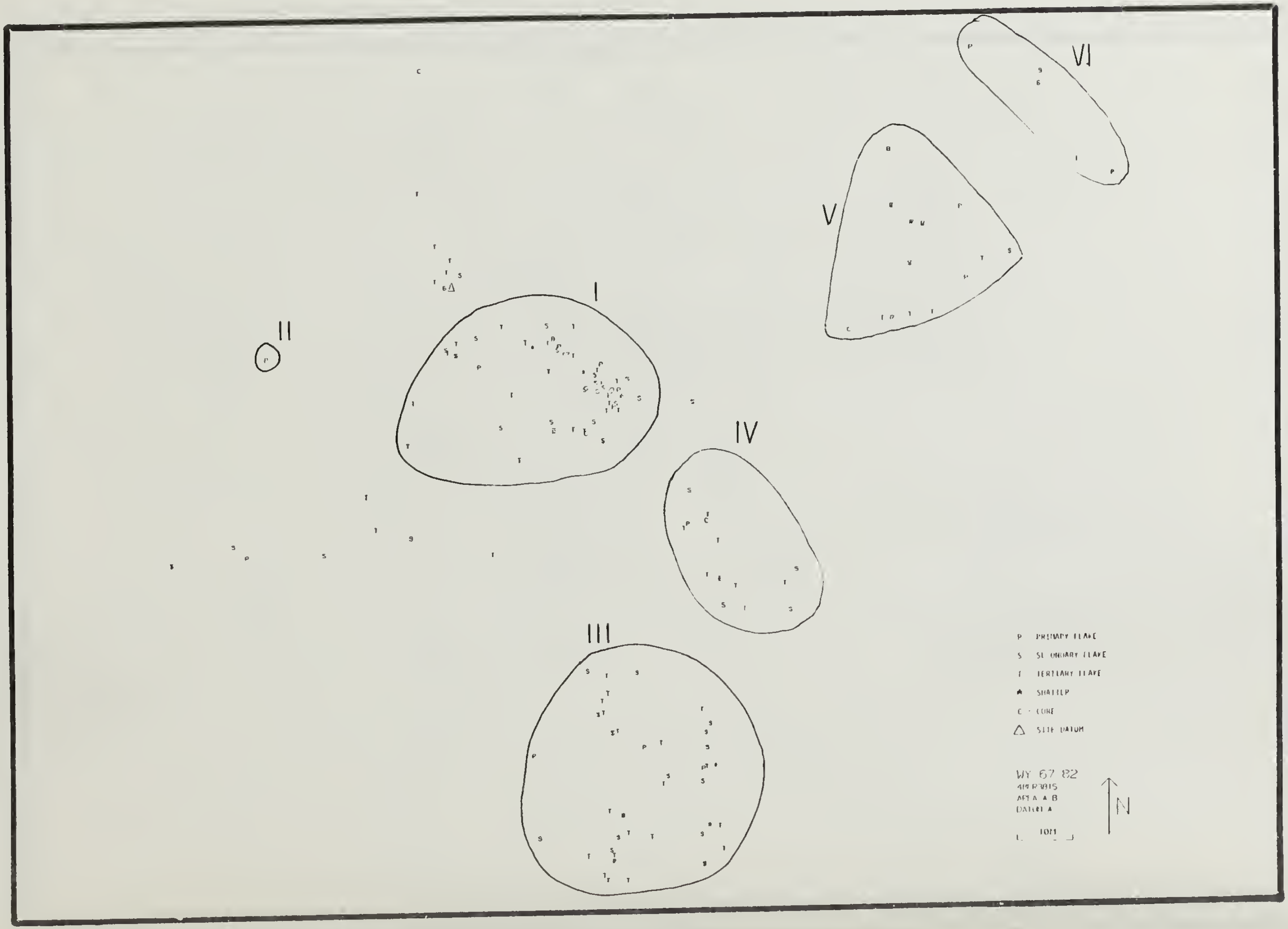

Figure 5.10. 48CR3815, plot of core and debitage types.

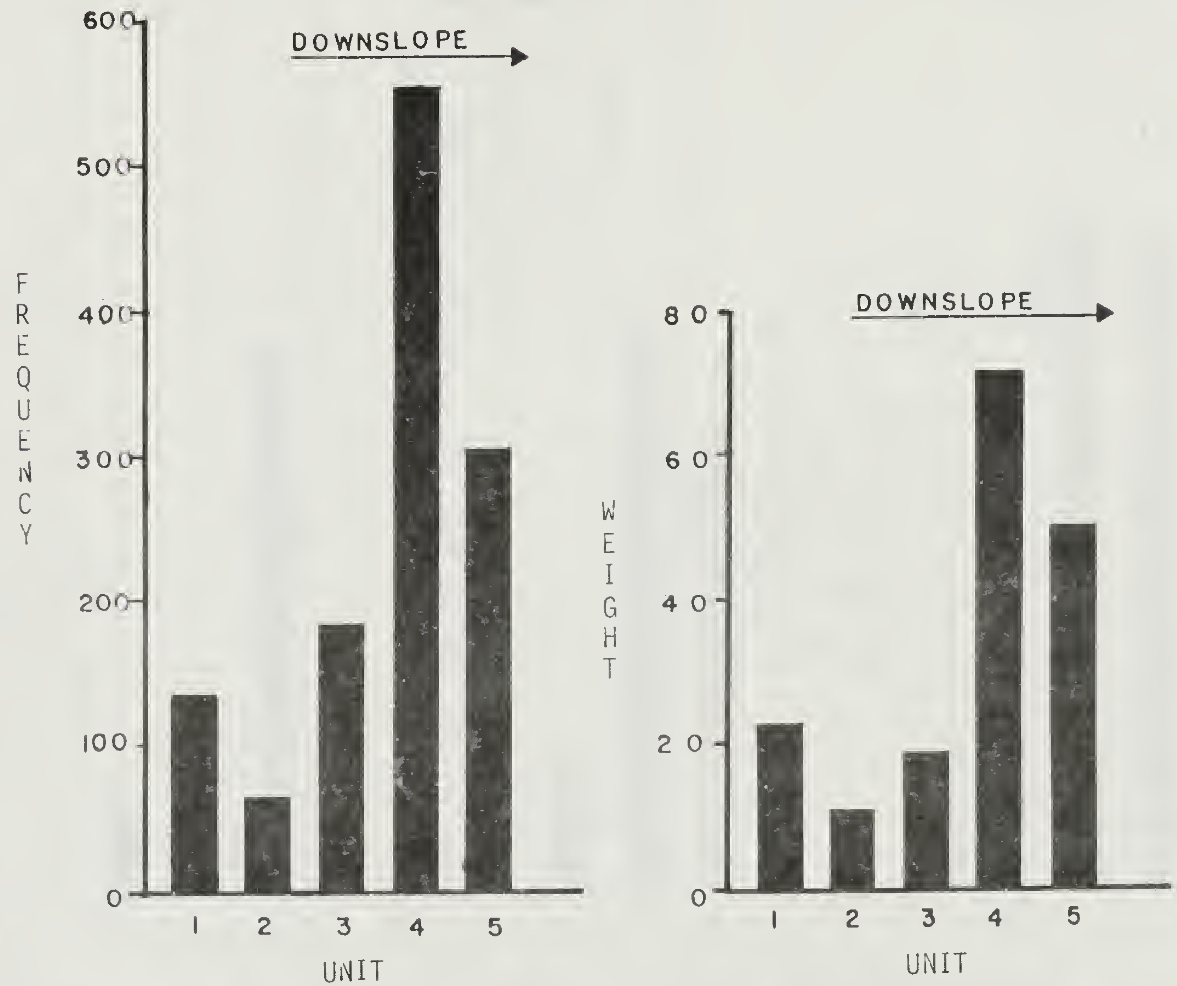

Figure 5.11. Bar graph of rock frequencies and weight, 48CR3815.

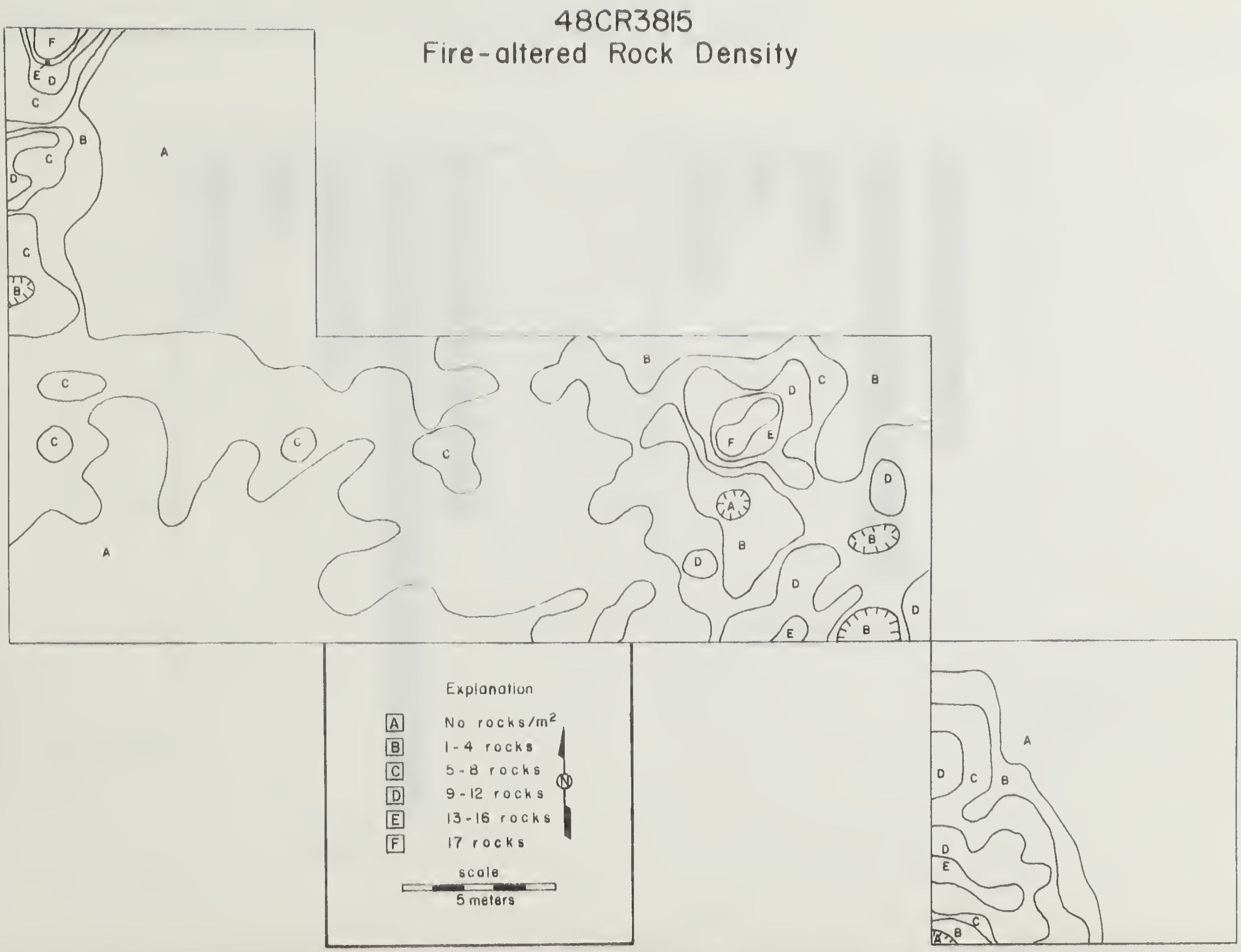

Figure 5.12. Contour map of fire-affected rock densities at 48CR3815.

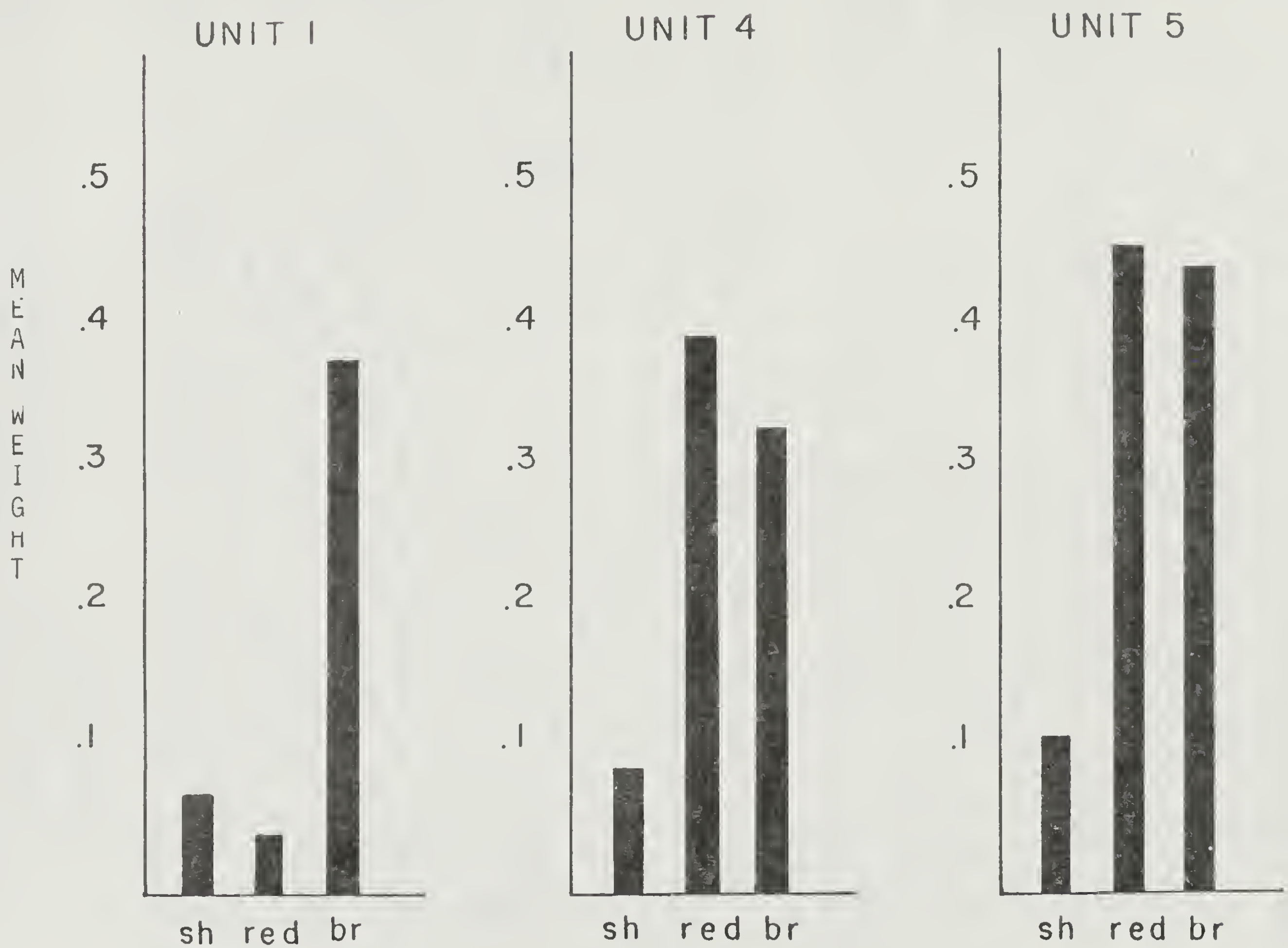

Figure 5.13. Mean weights of rock type by unit.

utilized flake and two hearths were mapped within a 60 m^2 area. Eighteen of the 22 artifacts were made from non-dendritic chert (Table 5.3). One flake of bioclastic chert was recovered. The remaining debitage and the utilized flake are of siltstone. An attempt to refit the debitage was unsuccessful, but is is thought this area is a small activity area where core reduction and tool modification occurred.

The remains of several activities apparently occur in Area III. Six hearths are present and clusters of artifacts can be discerned (Figure 4.7 and 5.9). No general pattern of material or artifact type surrounding the hearths is apparent. Most of the artifacts consist of core reduction and tool retouch flakes made from locally available chert and quartzites. The most common of which is non-dendritic chert. These artifacts occur within 2-3 m of the hearth as well as 10 m away. The most obvious patterns are linear arrangements of artifacts implying post- depositional and geological processes are responsible. These include topographic features such as slope and ephemeral drainages, as well as historic impacts such as livestock grazing and road construction.

Clusters IV and VI appear to be the result of erosional processes or a result of road construction or drainage channels. Hearths associated with Area VI tended to be arranged in a linear pattern.

Cluster V is on a portion of the site which exhibits a 3-5° slope and so has been subjected to erosional processes. Two partially intact hearths were observed, but only seven artifacts were found within two meters of the hearths. The remaining artifacts are at least five meters away and all but two are downslope from the hearths.

A higher frequency of quartzite occurs here than at other clusters. The only other material type found was non-dendritic chert, the dominant raw material type at the site. One core and two bifaces were recovered. The remaining artifacts observed include core and biface reduction flakes.

On the basis of these studies, it is suggested that 48CR3815, 48CR3814, and 48CR3812 represent prehistoric campsites which were reoccupied through time. Radiocarbon dates and diagnostic projectile points at all three sites indicate reuse of these locales, apparently for a number of reasons. A number of specific tasks in distinct areas occurred and include lithic tool production and plant and animal processing activities. Generally, evidence for different occupations overlaps one another on the present ground surface creating a palimpsest. Several areas which may represent separate activity areas were identified at each site.

Site Function

Analysis of lithic artifacts was performed on assemblages from four sites investigated during this project and from another 26 located within the Sage Creek Basin. Analysis included determining raw material and artifact/tool type. Locations of all 30 sites used appear in Figure 5.14. The goal of this analysis is to test

Table 5.3. Breakdown of artifacts recovered at subdatum A-2, 48CR3815.

	ARTIFACT TYPE				
RAW MATERIAL TYPE	PRIMARY	SECONDARY	TERTIARY	UTILIZED FLAKE	TOTAL
Siltstone	1	1		1	3
Bioclastic chert		1			1
Non-dendritic chert		6	12		18
Total	1	8	12	1	22

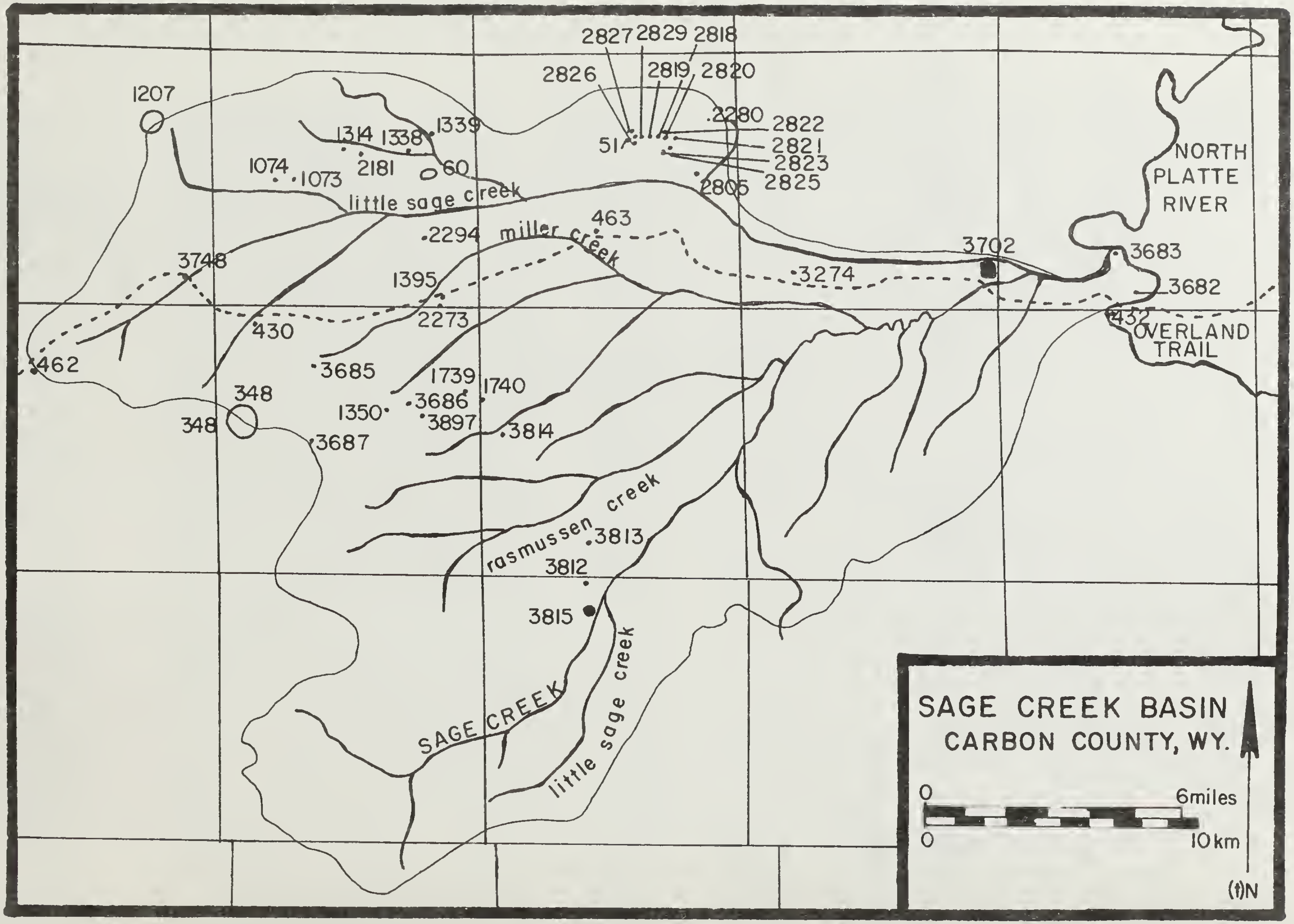

Figure 5.14. Location of archeological sites in the Sage Creek Basin.

the two models of prehistoric adaptation in southcentral Wyoming: differences are due to change in adaptation through time or are the result of different seasonal use of an area.

Assemblage diversity indices were calculated for both tools and raw materials from 12 of the 30 sites analyzed for this project. Assemblages from these sites were sufficiently large to make these comparisons. The Shannon-Wiener Index (Pielou 1974) was used to calculate diversity because it measures both the number and evenness of the distribution of items in an assemblage or sample.

A number of site attributes were examined to test these models. These are summarized in Table 5.4 and include tool and raw material diversity (where available), site composition, site size, time periods and topographic setting.

In the first case, lithic tool and raw material diversity indices were compared (Figure 5.15). Examination of these graphs shows that in each of the tool and raw material diversity indices, there are distinct peaks of low middle and high assemblage diversity. This better fits the Powder River Basin model than the Red Desert model.

There appears to be a strong correlation of the tool and raw material diversity indices. A Pearson's "r" correlation coefficient was calculated for the two indices for 12 sites. The results are that $r = 0.9475184$ and $r^2 = .8977911$, indicating a possible strong relationship between the two. This may be an indication that there are greater differences between types of sites in the Sage Creek Basin than in the Red Desert. It may be possible to distinguish limited activity versus residential sites in this area. It is also possible that this simply reflects reoccupation.

There also appears to be an indication of differences in sites related to distinct site types. Figure 5.16 shows a graph of the number of sites arranged by overall site size in square meters. There appear to be at least three peaks analogous to very small size sites, a medium range and very large sites. A crosstabulation of site size by tool diversity (see Table 5.4) indicates that overall, high tool diversity correlates with large site size. This, again, may point to more of a Powder River Basin system of surface lithic sites for the Sage Creek Basin.

Only five sites could be placed in a chronological framework. These had relatively high tool and raw material diversity indices (Table 5.4). Inferences concerning changes in adaptation through time are difficult to make based on such a small sample. As noted in the chronological section, 48CR3815 contained virtually the same raw materials and artifacts from the Paleoindian through the Late Prehistoric levels. This implies that little change in adaptation occurred through time at least at this site.

This information is difficult to interpret possibly because of methodological weaknesses such as a limited data base, few chronological indicators, and differential site preservation due to erosion and vandalism. Another problem is that the techniques employed were originally developed for the Powder River Basin. Although resources in the Sage Creek Basin more closely approximate

Table 5.4. Summary data, Prehistoric sites in the Sage Creek Drainage Basin (blank column indicates data not available).

Site	Description	Size (square meters)	Time Period	Tool Diversity	Raw Material Diversity	Topographic Location	Collections Available
CR51	Stone circles, lithics, hearths	Unknown	Unknown	--	--	Ridgetop	No
CR60	Hearths, lithics	230	Unknown	--	--	Terrace, low order drainage	No
CR69	Stone circles, lithics	Unknown	Unknown	--	--	Ridgetop	No
CR1073	Lithics and raw material	156	Protohistoric (trade bead)	0.0000	0.3250	Ridgeslope	Yes
CR1074	Hearths, lithics	816	Unknown	0.0000	0.0000	Ridgetop	Yes
CR1082	Lithics	378	Late Prehistoric (point)	0.6931	0.6730	Terrace, low order drainage	Yes
CR1314	Lithics, fired rock	120	Unknown	0.0000	0.0000	Ridgetop	Yes
CR1338	Lithics, fired rock	450	Unknown	0.0000	0.0000	Terrace, low order drainage	Yes
CR1339	Lithics, hearths, fired rock	35,000	Unknown	1.0397	1.0753	Ridgetop	Yes
CR2293	Lithics, fired rock, possible (burial?)	32	Unknown	1.0397	1.1466	Terrace, low order drainage	Yes
CR2294	Lithics, hearths	4,200	Unknown	1.0397	0.8390	Ridgetop	Yes
CR2818	Lithics, hearths	400	Unknown	--	--	Dune	No
CR2819	Lithics, hearths	490	Late Archaic (point)	--	--	Ridge	No
CR2820	Lithics, fired rock	54	Late Prehistoric (point)	--	--	Ridge	No
CR2822	Lithics, fired rock	405	Unknown	--	--	Ridge	No
CR2823	Lithics, fired rock	20,000	Middle Archaic (point)	--	--	Ridge	No
CR2824	Lithics, fired rock	800	Unknown	--	--	Ridge	No
CR2825	Lithics, fired rock	2,800	Unknown	--	--	Terrace, low order drainage	No
CR2826	Lithics, fired rock	800	Unknown	--	--	Ridge	No
CR2827	Lithics, fired rock	1,750	Unknown	--	--	Dune	No

Table 5.4. (continued)

Site	Description	Size (square meters)	Time Period	Tool Diversity	Raw Material Diversity	Topographic Location	Collections Available
CR2828	Lithics, fired rock	725	Unknown	--	--	Dune	No
CR2829	Lithics, fired rock	2,655	Unknown	--	--	Dune	No
CR3274	Lithics, fired rock	3,850	Late Prehistoric (point)	--	--	Ridge	No
CR3812	Lithics, fired rock	3,000	Late Archaic (point)	1.9686	1.4612	Ridge	Yes
CR3813	Lithics, fired rock	15,000	Unknown	1.6413	1.1207	Terrace, low order drainage	Yes
CR3814	Lithics, hearths, fired rock	20,000	Middle Archaic	1.7237	1.5929	Ridge	Yes
CR3815	Lithics, hearths, buried components	16,000	Paleoindian to Late Prehistoric	1.8792	1.1957	Terrace - Sage Creek	Yes
CR3897	Lithics	Unknown	Unknown	--	--	Ridge	No
CR1739	Lithics	6,792	Middle Archaic	--	--	Ridgetop	No
CR1740	Lithics, fired rock	120	Unknown	--	--	Terrace, low order drainage	No

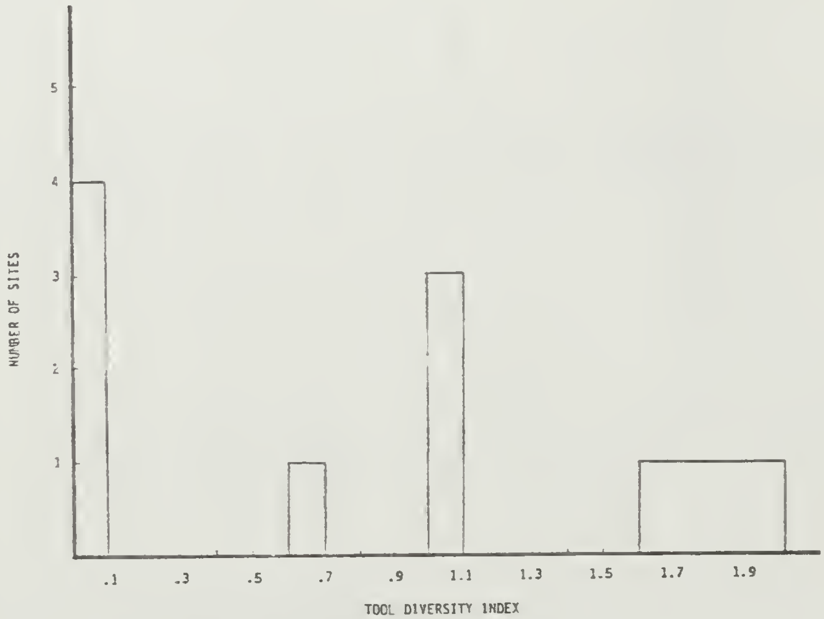

Figure 52. Graph of tool diversity indices.

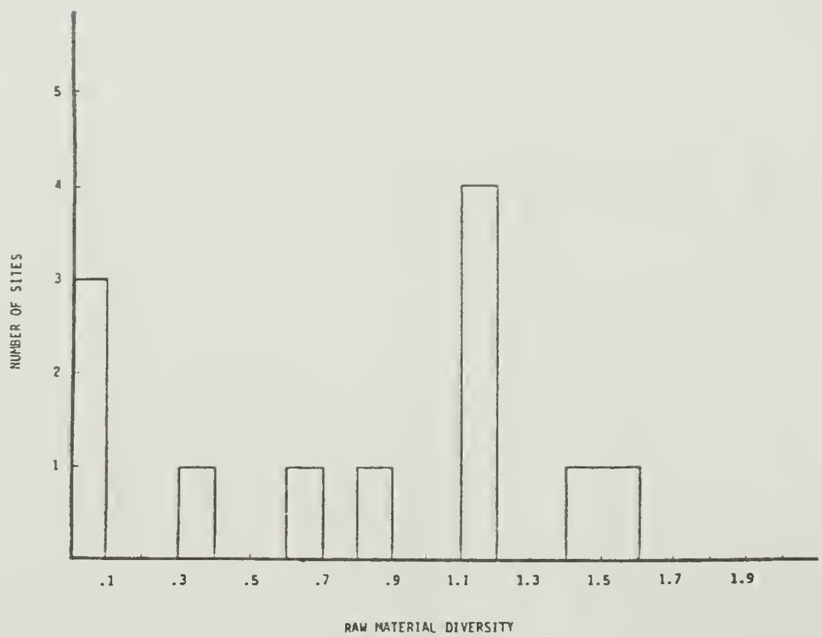

Figure 5.15. Graph of tool and raw material diversity indices.

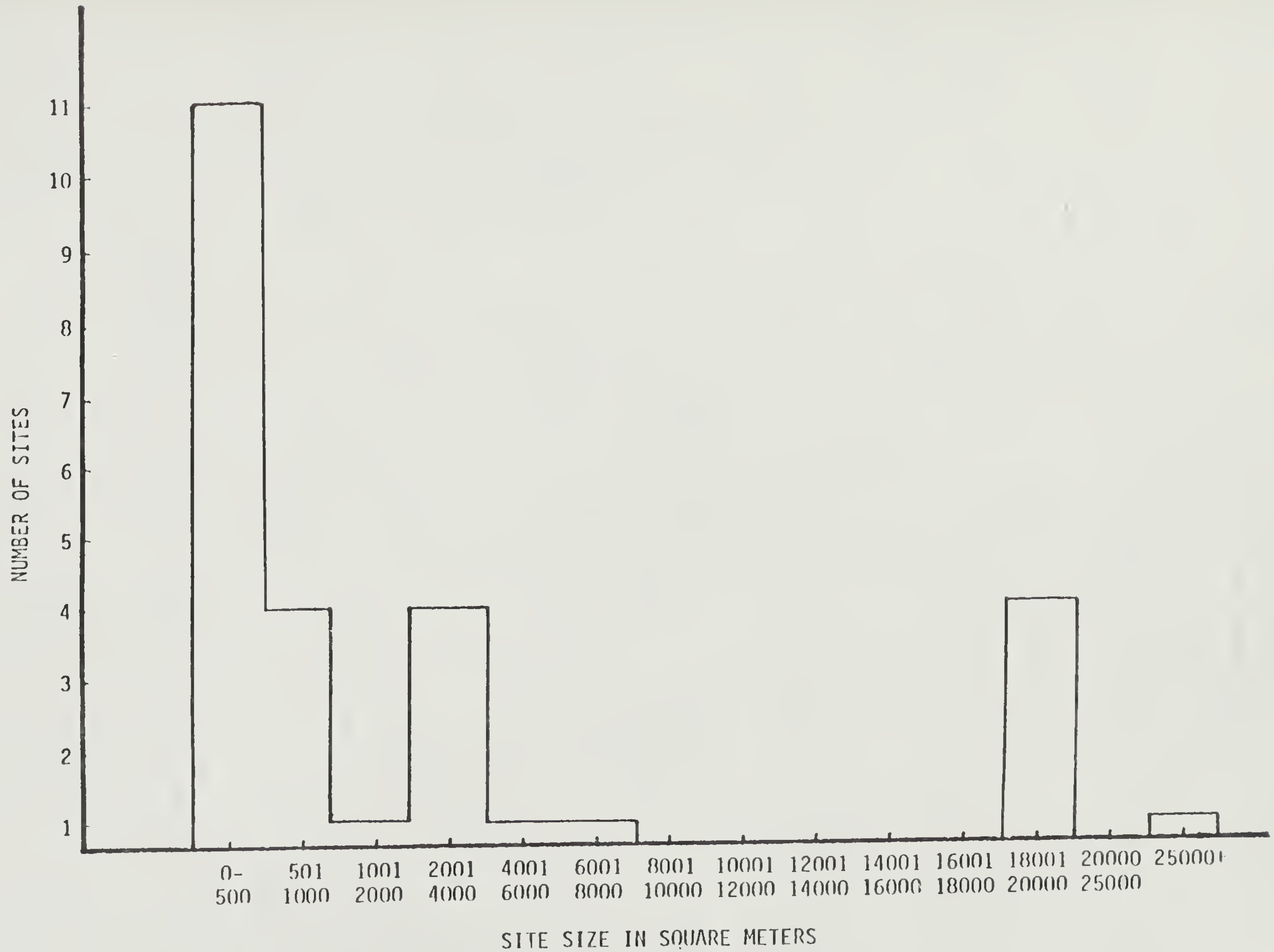

Figure 5.16. Graph of site area.

the linear arrangement found in the Powder River Basin, the area as a whole is more arid than the Powder River Basin. Settlement in the Sage Creek Basin may have been more constrained by availability of water than in the Powder River Basin. High diversity indices at sites away from permanent water may be the result of reoccupation.

CHAPTER 6
SUMMARY

William R. Latady, Jr.

Two surface artifact scatters and two stratified sites were investigated as a result of proposed highway construction. Data obtained from the artifacts collected at these sites were used to address research questions on chronology, structure and settlement and subsistence patterns.

The Sage Creek Site, 48CR3815, was tested and portions within the right-of-way were excavated. This site is a stratified prehistoric camp which was occupied during the Paleoindian, Early Archaic, Middle Archaic, Late Archaic, and Late Prehistoric periods. The Paleoindian period was divided into two periods of occupation based on radiocarbon dates. Apparently, at least six periods of occupation occurred at this site.

At 48CR3814, investigations were confined to recording the artifacts and features on the surface and excavating three features found during monitoring of construction activities. These features were radiocarbon dated to the Middle Archaic Period and contained the charred remains of juniper wood.

The other two sites, 48CR3812 and 48CR3813, were mapped. Excavations were not conducted at 48CR3813. At 48CR3812, a hearth observed on the surface was excavated. This feature produced a Late Prehistoric Period radiocarbon date, charred sagebrush wood and modern intrusive plant seeds and fruits from at least four taxa. Evidence of buried cultural deposits was not found.

Cultural chronology in the Sage Creek Basin is believed to resemble that worked out for the Northwestern Plains. Little evidence was found to refine this chronology. Sites were recorded which contained components dating from the Paleoindian to the Late Prehistoric Periods but few diagnostic artifacts were recovered.

Site structure was studied at 48CR3812, 48CR3814 and 48CR3815. These sites contained scatters of chipped stone artifacts on the ground surface. All have been subjected to erosional processes making pattern recognition difficult. Evidently these sites were reoccupied from at least the Middle Archaic to Late Prehistoric Periods.

A brief examination of fire-affected rock was undertaken at 48CR3812 and 48CR3815. This examination has documented variation in the distribution of the rock. Although a number of variables might influence this distribution, no single factor was isolated. Finer control over a scatter area might be employed to help explain variation. Mapping of the various sizes and types of rock helped to delineate rock concentrations, but the weight of rocks was calculated by 10 x 10 m unit. Field procedures might have obscured certain geological processes which occurred at the site. It is suggested that weighing the rocks within a smaller area might help to further delineate the patterns noted during this study. The possibility exists that additional control would help to define geological and cultural processes.

The large amount of shattered rock may indicate that at 48CR3812 and 48CR3815 stone boiling was an important cooking procedure. Little evidence of intensive hunting occurred at any of the sites. The presence of projectile points as well as tools with edge angles suitable for meat or hide cutting implies that hunting was a part of the subsistence strategy. However, the lack of faunal material recovered from 48CR3815 suggests that hunting was not very important at this site.

The presence of preserved macrofloral remains in hearths from the Late Prehistoric and lower Paleoindian levels may indicate plant processing. The existence of these preserved taxa may also imply two different periods of site use: a late summer-fall or spring occupation around 9,000-8,000 years ago and a mid-summer occupation 1200 years ago.

Analysis of lithic assemblages suggests a settlement system more closely approaching that in the Powder River Basin than in the Red Desert. Although these results must be viewed as preliminary, reasons for the similarity might be due to the patchy resource distribution in the Red Desert versus the more linear arrangement in the Powder River Basin and Sage Creek Basin.

Finally, two models were generated to account for differences in the archaeological record. Change in adaptation through time versus reuse on a seasonal basis was expected to be observable through raw material and tool diversity. An inadequate surface artifact sample made examination of these models difficult. Analysis of artifacts from excavated levels at 48CR3815 indicates similar uses of the site through time. These data suggest that little change in adaptation occurred in the Sage Creek Basin between 8700 and 1200 years ago.

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APPENDIX 1

GEOARCHEOLOGY OF THE SAGE CREEK SITE, 48CR3815

By

Michael McFaul

The Sage Creek site (48CR3815) offers both archeologists and geomorphologists a unique look into the Quaternary past. The site's soil stratigraphic context presents the archeologist identifiable boundaries for relative age determinations and site extent delineations. These same soil-sediment relations provide the foundation for the geomorphologist to interpret Pinedale-Holocene climatic events. Located at the foot of the Rocky Mountains the Sage Creek site also provides an opportunity to compare glacial based climatic models (Benedict 1981) with the fluvial and eolian models of the plains (Moran et al. 1976). Viewed in this light, the environmental history of Sage Creek seems to mesh with both chronologies.

PHYSIOGRAPHY

The Sage Creek site is included in the south facing 9-11 degree slope of the perennial Sage Creek between the crest of a shallow swale in the valley wall and the modern floodplain. The valley is cut in the Cretaceous Frontier Formation (Welder and McGreevy 1966) and exposures of interbedded clayey shales, tabular shales, and sandstones are found in the study area. A fluvial cobble armored Pleistocene terrace northeast of the site suggests the swale was cut prior to the modern Sage Creek valley and that it has provided easy access to and from the Sage Creek drainage since the Pleistocene Epoch.

FRONTIER FORMATION

The bedrock Frontier Formation at the site consists of dark gray-blue to black clayey shales similar to the basal Frontier formation member described by Nicoll (1963) in the Laramie Basin. The shales are dimidiated diagonally by a southeastwardly plunging sandstone lens one to one and one-half meters thick which dips eastwardly at nine degrees and strikes north-northwest to south-southeastwardly plane. Exposures of the sandstone, approximately 35 m west of the site are the apparent source of the aeolian sands mantling a 1170±100 years B.P. dated hearth at the crest of the swale (Test Unit 1).

Additional evidence for redeposition of the Frontier Formation is seen in colluvial sheetwash deposits downslope from the swale toward the modern floodplain. These deposits consist of thin pebble and sand lenses (Backhoe Trench 1) having the same 11 to 15° slope as the present valley wall. These coarse materials are interbedded with lenses of tabular shales whose fabric also indicates redeposition from upslope. Redeposition of the Frontier Formation plays a key role in understanding the Sage Creek site. It is responsible for the burial of the cultural materials and provides the matrix for preserving the soil-climatic record

STRATIGRAPHY

The Sage Creek site is a stratified multicomponent site consisting of six traceable strata (Figures 1 and 2). This sequence includes five Late Pinedale-Holocene Quaternary Period units unconformably resting on the Cretaceous Period Frontier Formation sandstones and shales. The Quaternary units are differentiated by texture, radiocarbon dates, and cultural affiliations.

Geologically (oldest to youngest) the stratigraphic units are:

1. A grayish-brown (2.5Y 5/2) to light yellowish-brown (2.5Y 6/4) clay loam overlying the Frontier Formation in Backhoe Trench 1 at 165 cm and at 163 cm in Backhoe Trench 2.
2. A light gray (2.5Y 7/2) silty clay fluvial deposit at 85.150 cm in Backhoe Trench 2 dated 9150±810 years B.P.
3. A reddish-brown (2.5Y 6/4) to olive-brown (2.5Y 5/4) sandy clay loam at 98-168 cm in Test Unit 2 and 98-165 cm in Backhoe Trench 1. Fluxions in gravel percentages and the comparative increase in gravel percentages implies the sequential deposition of this colluvial unit. Radiocarbon dates from the upper and a lower member of the unit indicate colluviation had began prior to 8730±260 years B.P. and concluded approximately 8210±260 years B.P.
4. A light gray (2.5Y 7/2) loam at 64 to 98 cm in Test Unit 2. Stratigraphic correlation is suggested with an Early Archaic point and a hearth dated 6570±130 years B.P. at 65 to 98 cm in Backhoe Trench 1.
5. A light brownish-gray (10YR 6/2) to light gray (2.5Y 7/2) clay loam 0 to 65 cm in Test Unit 2 and 0-TD in Test Unit 3. A hearth 0 to 21 cm in Test Unit 3 dated 1750±120 years B.P. Pedogenic horizonation suggests two periods of deposition are present within this unit.
6. A loose brown (10YR 5/3) dune sand at the surface in Test Unit 1. A hearth covered by this sand is dated 1170±100 years B.P. and suggests dune migration followed hearth use.

PEDOLOGY

Soils at 48CR3815 form a catena (Ruhe 1975) which grades from an Entisol near the crest of the valley wall to an Inceptisol at Test Unit 3 to an Aridisol near the floodplain in Backhoe Trench 2.

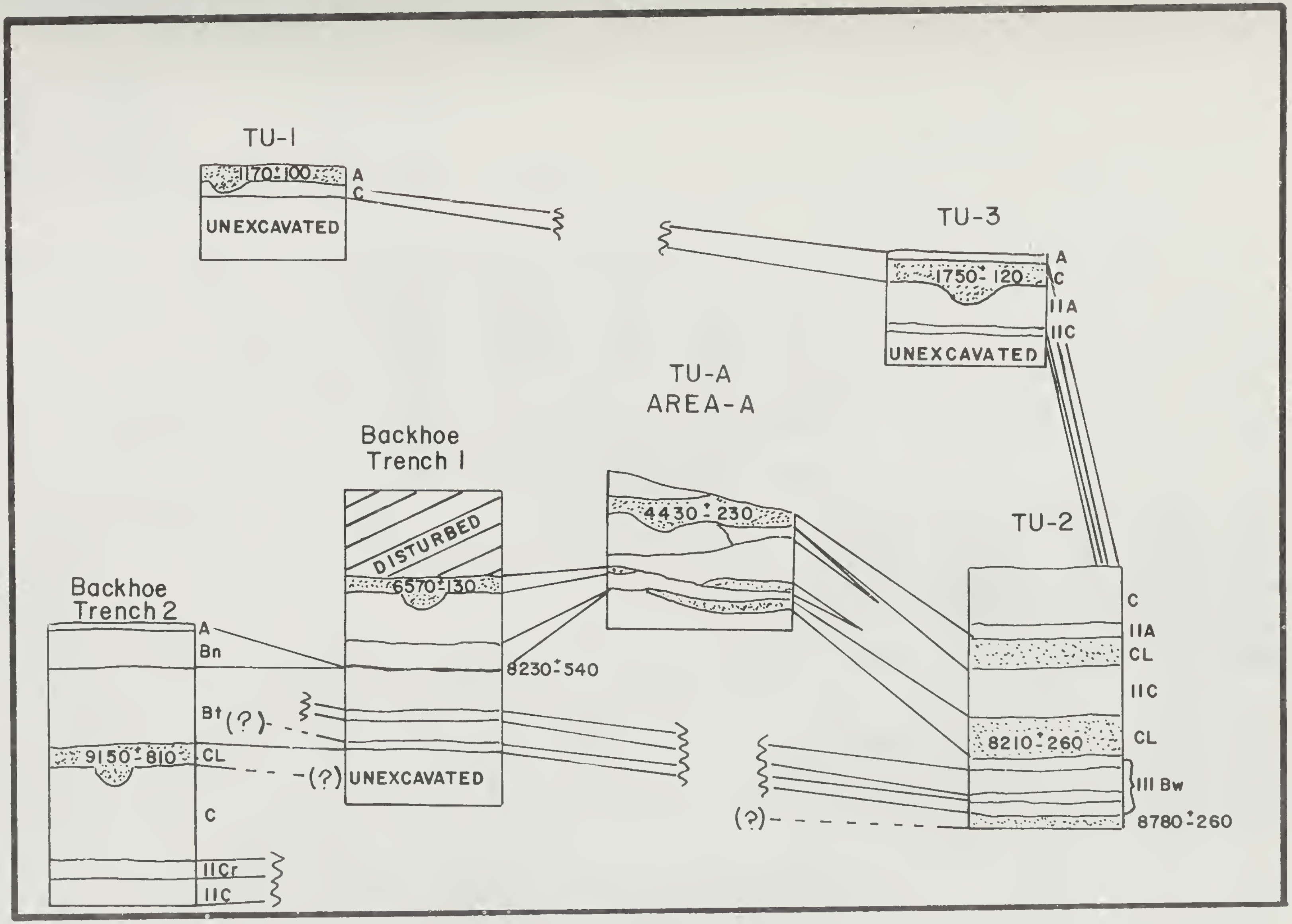

Figure 1. Schematic soil profile of Areas A and B at 48CR3815.

Test Unit #1

DEPTH	COLOR	TEXTURE	HORIZON	DATE
0-10	Brown	S	A	
0-10			Cultural horizon	1170±100BP
0-TD	Light Gray	CL	C	Frontier Fm.

Test Unit #3

DEPTH	COLOR	TEXTURE	HORIZON	DATE
0-5	Light brownish gray	CL	A	
0-21	Very dark gray	C	Cultural Horizon	1750±120BP
5-23	Light gray	CL	C	
23-48	Brown	CL	IIA	
48-52 TD	Light gray	C	IIBk	

Test Unit #2

DEPTH	COLOR	TEXTURE	HORIZON	DATE
0-38	Light gray	CL	C	
38-64	Pale brown	CL	IIA	
45-65	Grayish brown	SCL	Cultural Horizon	?
64-98	Light gray	L	IIC	
98-125	Very dark gray	SCL	Cultural Horizon	8210±260BP
125-130	Very pale brown	SCL	IIIBw1	
130-147	Very pale brown	SCL	IIIBw2	
147-151	Pink	SCL	IIIBw3	
140-150			Cultural Horizon	8730±260BP
151-160	Pink	SCL	IIIBw4	
161-168 TD	Light reddish brown	SCL	IIIBw5	

Backhoe Trench #1

DEPTH	COLOR	TEXTURE	HORIZON	DATE
0-57	------------------------DISTURBED------------------------			
ca.30-40	---------------------bladed hearth--------------			4430BP±230
57-65	Light yellowish brown	grSL	?	
65-98	Dark gray	C	Cultural Horizon	7000-5000BP & Early Archaic point
98-113	Pale yellow	SCL	(Bw?)	
113-115	Very dark gray	grSCL	Cultural Horizon	8230BP±540
115-142	Pale yellow	SCL	(Bw?)	
142-146	Light gray	grSCL	(Bw?)	
146-161	Olive brown	SCL	(Bw?)	
161-165	Light olive brown	SCL	(Bw)	
165-TD	Grayish brown	grCL		Frontier Fm.

Backhoe Trench #2

DEPTH	COLOR	TEXTURE	HORIZON	DATE
0-5	Light brownish gray	SCL	A	
5-30	Light olive brown	SCL	Bn	
30-85	Light gray	C	Bt	
80-90			Cultural Horizon	9150BP±810
85-150	Light gray	SiC	C	
150-163	Light gray	CL	IICr	
163-TD	Light yellowish brown	CL	IIC	Frontier Fm.

Fiugre 2. Soil sediment units at 48CR3815.

As these soils become more developed the complexity of their horizonation increases along with the depth to parent material. Sediment analysis (Table 1) indicates colluvial and alluvial process are in part responsible for the increasing aggredation downslope and the preservation of cultural materials radiocarbon dated to 9150±810 years B.P. Soil Formation has also played a role in preserving the cultural record at Sage Creek by protecting accumulations of sediment from erosion.

The soils developed upon the colluvial and alluvial accumulations are considered to be geosols or soil-stratigraphic units (Birkeland 1974; Morrison 1967) having pedogenic horizonation which maintains a constant relationship with the Frontier Formation across the site. This relationship provides temporal and stratigraphic correlations between the soil-sediment profiles and the basis for reconstruction of the site's paleoenvironment.

Specific soil descriptions from the swale to the floodplain are as follows:

Test Unit 1 - A very shallow soil A/Cr horizonation, minimal development over weathered Frontier Formation bedrock. The depth of the profile depends upon the thickness of the eolian sands over the bedrock. Classification: Lithic Cryasomment (Soil Survey Staff 1975:130).

Test Unit 3 - A clay loam textured soil showing two pedogenic periods (A/C, IIA/IIBk). Similarities of parent materials, colors (brown A horizons, light gray B horizons), depth, and development indicate two brief periods of soil Formation under comparable environments. Classification: Typic Cryochrept (Soil Survey Staff 1975:248).

Test Unit 2 - Located approximately six meters downslope from Test Unit 3. This deeper unit has a C, IIA/IIC, IIIBw horizonation. The soil is thought to be truncated exposing a C horizon at the surface. At depths greater than 125 centimeters the soil becomes more reddish in color suggesting a drier climatic period of soil Formation (Birkeland 1974:231). Classification: Typic Cryochrept (Soil Survey Staff 1975:248).

Backhoe Trench 1 - Approximately 12 meters west of Test Unit 2 and one meter lower in elevation, this soil's upper horizons have been removed by highway construction. This soil is not classified since the diagnostic horizons have been removed. The profile does contain what appears to be a IIIBw horizon and radiocarbon dates are similar to those from a similar sandy clay loam horizon in Test Unit 2. The change in color hues, 10YR in Test Unit 2 and 2.5Y in Backhoe Trench 1 suggest increased moisture availability downslope.

Backhoe Trench 2 - approximately 15 meters west of Backhoe Trench 1 and three meters closer to the floodplain, this soil profile is very well developed (A/Bw/Bt/C/IICr/IIC). Its prizmatic soil structure and the high sodium content of Sage Creek (City of Rawlins 1983) indicate the presence of a natric horizon (Bn). The natric horizon and

Table 1. Laboratory analyses.

	Horizon	Depth in cm	% 2 mm	% Sand	% Coarse Silt	% Tine Silty	% Clay	Texture	pH	% $CaCO_3$	Color (dry)	Dates
T.U. 3	Cult. level	0-21	19.26	22.92	16.80	18.90	41.38	C	7.9	4.0	Very dark gray 10YR 3/1	1750 ± 120 B.P.
	A	0-5	13.73	38.41	16.41	12.32	32.85	CL	8.3	5.0	Light brownish gray 10YR 6/2	
	C	5-23	5.59	38.66	14.34	11.51	35.49	CL	7.9	6.0	Light gray 10YR 7/2	
	IIA	23-48	7.05	36.17	14.40	11.98	37.45	CL	8.1	7.0	Brown 10YR 5/3	
	IIBk	48-52	8.69	29.03	21.06	10.58	39.39	C	7.0	10.0	Light gray 10YR 7/2	
T.U. 2	C	0-38	6.80	41.53	12.21	14.19	32.07	CL	8.0	7.0	Light gray 10YR 7/2	
	IIA	38-64	2.69	41.18	14.25	11.45	32.11	CL	8.5	9.0	Pale brown 10YR 6/3	
	Cult. level	45-65	8.85	50.07	14.30	9.56	26.07	SCL	8.4	10.0	Grayish brown 10YR 5/2	
	IIC	64-98	3.42	34.93	18.44	19.88	26.75	L	7.9	7.5	Light gray 2.5Y 7/2	
	Cult. level	98-125	15.00	45.08	14.75	9.80	30.37	GSCL	7.0	10.5	Very dark gray 5YR 3/1	8210 ± 260 B.P.
	IIIBw	125-130	10.48	49.88	12.32	11.60	27.20	SCL	8.6	10.0	Very pale brown 10YR 7/2	
	IIIBw	130-147	3.82	46.38	12.50	14.53	26.59	SCL	8.7	10.0	Very pale brown 10YR 7/2	
	Cult. level	140-150										8730±260 B.P.
	IIIBw	147-151	10.47	47.44	14.46	10.39	27.71	SCL	8.8	9.0	Pink 5YR 7/4	
	IIIBw	151-160	3.07	45.32	16.58	10.42	27.68	SLC	8.7	9.0	Pink 5YR 7/4	
	IIIBw	160-168	5.48	51.94	14.74	7.12	26.20	SCL	8.7	9.0	Light reddish brown 2.5YR 6/4	
BHT#1		0-57 Disturbed										
		57-65	29.32	57.09	18.22	4.93	19.76	GSL	6.8	6.0	Light yellowish brown 2.5Y 6/4	
	Cult. level	65-98	18.05	36.91	14.39	6.89	41.81	C	7.4	6.0	Dark gray 10YR 4/1	6570 ± 130 B.P. & Early Archaic pt.
		98-113	8.29	52.57	14.20	8.11	25.12	SCL	7.8	5.0	Pale yellow 2.5Y 7/4	
	Cult. level	113-115	11.46	57.12	12.32	9.73	20.83	SCL	7.75	3.0	Very dark gray 10YR 8/1	8230 ± 540 B.P.
		115-142	6.74	47.96	14.29	7.62	30.13	SCL	8.1	7.0	Pale yellow 2.5Y 7/4	
		142-146	31.06	53.19	10.16	9.45	27.20	GSCL	8.4	5.0	Light gray 2.5Y 7/2	
		146-161	5.22	51.79	12.36	10.31	25.54	SCL	7.65	7.0	Olive brown 2.5Y 6/4	
		161-165	4.79	48.48	18.93	7.11	25.48	SCL	8.6	7.0	Light olive brown 2.5Y 5/4	
		165	22.93	37.72	10.25	18.45	33.58	CL	8.1	14.5	Grayish brown 2.5Y 5/2	
BHT#2	A	0-5	6.34	45.01	7.28	16.01	31.70	SCL	8.4	2.0	Light brownish gray 2.5Y 6/2	
	Bn	5-30	6.88	48.03	4.10	14.33	33.54	SCL	8.5	3.0	Light olive brown 2.5Y 5/4	
	B+	30-85	1.03	6.16	12.60	25.93	55.31	C	8.5	6.0	Light gray 2.5Y 7/2	
	Cult. level	80-90										9150 ± 810 B.P.
	C	85-150	.49	4.38	14.68	28.51	52.43	SLC	8.7	4.0	Light gray 2.5Y 7/2	
	IICr	150-163	7.34	35.70	16.41	11.64	36.25	CL	8.7	5.0	Light gray 2.5Y 7/2	
	IIC	163	2.69	41.96	10.51	13.93	33.60	CL	8.5	3.0	Light yellowish brown 2.5Y 6/4	

the greater than 70 centimeter thick silty clay C horizon and the profiles location show the influence of fluvial activity. Classification: Aquic Natrarigids (Soil Survey Staff 1975:163-164)

PALEOENVIRONMENTAL RECONSTRUCTION

This reconstruction is built upon a combination of the geomorphic and pedogenic relationships described at 48CR3815. The events included in it are demarcated by an understanding of Quaternary history together with radiocarbon and cultural dates from materials recovered during the 1982 field excavations.

Pleistocene

Cobble armored terraces such as those seen in the study area are a common Pleistocene feature in the Rocky Mountains. The sphericity, lithology, and the size of the cobble armor indicate the Sage Creek drainage was choked with alluvial materials transported from the mountains to the south.

Pleistocene to 9150±810 years B.P.

Following cobble deposition the stream abandoned this floodplain and began a cycle of downcutting in which the swale and the modern Sage Creek were created. As downcutting progressed colluvial and lag deposits began to accumulate at the foot of the valley wall upon the Frontier Formation (Figures 1 and 2). Similar deposits, dated 13,000 years B.P. which are mantled by alluvial sediments in North Dakota (Clayton *et al*. 1976), signal the end of Pleistocene downcutting and mark the beginning of valley aggredation. As in North Dakota, this relationship of Pleistocene sediments mantling older geologic formations is useful in determining test unit depths. At Sage Creek the colluvial-lag deposits were covered by approximately 60 centimeters of silty clay alluvium (Figure 1) prior to 9150±810 years B.P. The thickness of these sediments below the dated horizon implies this stratigraphic unit has the potential to contain older cultural materials.

9150±810 years B.P. to 6570±130 years B.P.

This period of time is thought to represent a period of decreasing fluvial activity in which colluviation became the dominant environmental process at Sage Creek. This interpretation is provided by the increased percentages of sand and gravel sediments in Stratigraphic Unit 3. Colluviation suggests hillslope instability and the fluxions of in gravel percentages imply sequential deposition. Radiocarbon dates indicate deposition of this unit began prior to 8730±200 years B.P. and continued through 8210±260 years B.P.

6570±130 years B.P. to 4200 years B.P.

Evidence for Early Archaic occupation comes from a culturally dated point and a dated hearth (6570±130 years B.P.). Sediments associated with this period (Stratigraphic Unit 4) are finer textured suggesting eolian transport. The color hues and the amount of calcium carbonates in Stratigraphic Unit 3 in Test Unit 2 also indicate this period was a warmer climatic interval (Birkeland 1974).

Middle Archaic to 1170±100 years B.P.

Dated evidence for occupation during this time comes from a hearth dated at 4200±130 B.P. Researchers in the Rocky Mountains (Benedict 1981) and the Great Plains (Moran *et al*. 1976) consider this to be a period of wet-dry climatic fluctuations recognized by alternating periods of weak soil development and deposition. The modern and buried soils in Test Units 2 and 3 show this relationship. The dated hearth exposed at the surface in Test Unit 3 and the exhumed C horizon in Test Unit 2 suggest the higher portions of the valley wall began experiencing a period of erosion after 1750±120 years B.P.

1170±100 years B.P.to Present

Near the swale in the valley wall a hearth was dug into the Frontier bedrock. The hearth dated 1170±100 years B.P. and was partially covered by a loose dune sand sheet. This eolian deposit, the exhumed C horizon Test Unit 2, and the exposed hearth in Test Unit 3 indicate an erosional environment has affected the site since 1170±100 years B.P.

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APPENDIX 2

SUMMARY OF HEARTH/FIREPIT ATTRIBUTES

Compiled by

David G. Eckles
William R. Latady, Jr.

Site #	Level	Feature #	Dimensions	Morphology	Contents	Rock	Weight(kg)	Comments
48CR3812	Late Prehistoric (surface)	1	78 cm N-S x 67 cm E-W x 12 cm deep	Basin shape	Charcoal, faunal & macrofloral remains	70 quartzite & sandstone	24 kg	Radiocarbon date of 1220 BP ± 110, possible summer occupation
48CR3814	Middle Archaic	1	46 cm N-S x 42 cm E-W x 12 cm deep	Basin shape	Charcoal	None	--	Radiocarbon date of 4210 BP ± 130
	Middle Archaic	2	94 cm N-S x 94 cm E-W x 15 cm deep	Basin shape	Charcoal	Sandstone	10.6 kg	Radiocarbon date of 4200 BP ± 130, oxidation ring
	Middle Archaic	3	52 cm N-S x 57 cm E-W x 2 cm deep	Circular/ amorphous	Ash	None	--	Possible hearth clean-out
48CR3815	Late Prehistoric (surface)	1 (Area A)	60 cm N-S x 58 cm E-W x 27 cm deep	Basin	Charcoal, macro-floral remains	40 sandstone & quartzite	10.0 kg	Radiocarbon date of 1170 ±
	Late Prehistoric (surface)	2 (Area A)	25 cm N-S x 23 cm E-W x 2 cm deep	Circular/ amorphous	Small amount of charcoal	31 sandstone & diorite	2.75 kg	Possible clean-out
	Late Prehistoric (surface)	3 (Area A)	55 cm N-S x 52 cm E-W x 6 cm deep	Basin shape	Groundstone, charcoal, soil	12 sandstone & quartzite	11.75 kg	Oxidation ring
	Late Prehistoric (Surface)	4 (Area A)	27 cm E-W x 3-5 cm deep	Circular/ amorphous	Charcoal, soil	24 sandstone	1.5 kg	Possible clean-out
	Late Archaic (Surface)	1 (Area B)	66 cm E-W x 12 cm deep	Basin	Charcoal, macro-floral remains	Sandstone & quartzite	--	Radiocarbon date of 1750 BP ± 120, oxidation ring
	Late Archaic	1 (Area A)	48 cm E-W x 31 cm deep	Basin shape	Charcoal	Sandstone	--	--
	Late Archaic	2 (Area A)	78 cm N-S x 97 cm E-W x 10 cm deep	Circular/ amorphous	Charcoal, faunal material, lithic material	24 sandstone	--	Possible clean-out
	Middle Archaic	1 (Area B)	69 cm N-S x 25 cm E-W x	Basin shape	Charcoal	Sandstone & quartzite	--	Radiocarbon date of 4430 BP ± 230
	Middle Archaic	2 (Area B)	25 cm N-S x 15 cm E-W x 5 cm deep	Basin shape	Charcoal	5 sandstone	--	Probable hearth remnant

Site #	Level	Feature #	Dimensions	Morphology	Contents	Rock	Weight(kg)	Comments
48CR3815	Early Archaic	2 (Area B T.U. 2)	58 cm in diameter x 17 cm deep	Basin shape	Charcoal, macro-floral remains	15 sandstone 3 quartzite	--	Partially eroded by Sage Creek
	Early Archaic	1 (Area B Unit 1)	24 cm N-S x 33 cm E-W x 15 cm deep	Basin shape	Charcoal	7 sandstone	2.3 kg	Rock lined
	Early Archaic	1 (Area B Unit 3)	54 cm N-S x 18 cm deep	Basin shape	Charcoal, burned soil	None	--	--
	Early Archaic	1 (Area B Unit 4)	52 cm in diameter x 20 cm deep	Basin shape	Charcoal, burned	None	--	Radiocarbon date of 6520 ± 130 BP
	Upper Paleoindian	1 (Area B BHT)	90 cm N-S x 31 cm deep	Basin shape	Charcoal and burnt earth	None	--	Remnant due to backhoe, radio-carbon date of 8230 BP ± 540
	Upper Paleoindian	2 (T.U. 2 Level 6)	60 cm in x 18 cm deep	Basin shape	Oxidized sand-stone charcoal, lithic material	None	--	Radiocarbon date of 8210 ± 260
	Upper Paleoindian	2 (Area B Unit 3)	43 cm N-S x 11 cm deep	Basin shape	Charcoal, macro-floral remains	None	--	Early-mid-summer occupation
	Upper Paleoindian	3 (Area B (Unit A)	57 cm N-S x 65 cm E-W x 21 cm deep	Basin shape	Charcoal, macro-floral remains	Sandstone & quartzite	--	Possible late summer-early fall occupation
	Upper Paleoindian	4 (Area B Unit A)	51 cm N-S x 52 cm E-W x 40 cm deep	Cylindrical shape	Charcoal, macro-floral remains	1 quartzite	--	--
	Upper Paleoindian	1 (Area B Unit 6)	47 cm N-S x 43 cm E-W x 12 cm deep	Basinshape	Charcoal, burnt earth, macro-floral remains	Sandstone	--	Possible spring occupation
	Lower Paleoindian	1 (Area A Units 2 & 3)	46 cm N-S x 33 cm E-W x 25 cm deep	Cylindrical shape	Charcoal, burnt earth, macro-floral remains	None	--	Radiocarbon date 9150 BP ± 810 Possible alte summer-early fall occupation
	Lower Paleoindian	2 (Area B BHT #1)	Unknown	Circular/ amorphous	Charcoal, burnt earth	None	--	Almost destroyed by backhoe
	Lower Paleoindian	4 (Area B T.U. 2)	Unknown	Circular/ amorphous	Charcoal, burnt earth	None	--	Feature remnant

APPENDIX 3

LIST OF RADIOCARBON DATES

Compiled by

William R. Latady, Jr.

Site/Sample Designation	Lab #	Provenience	Material	Radiocarbon Age Years B.P.±1SD	Masca Corrected Years BC/AD±1SD
CR3812-1	RL 1801	T.U. 1, Fea. 1, Hearth	charcoal (*Artemisia tridentata*)	1220±110	AD 750±130
CR3814-1	RL 1817	Fea. 1, Hearth	charcoal (*Juniperus* sp.)	4210±360	2860BC±560
CR3814-2	RL 1818	Fea. 2, Hearth	charcoal (*Juniperus* sp.)	4200±130	2910BC±220
CR3815-1	RL 1748	T.U. 3, Fea. 1, Hearth	Charcoal (*Artemisia tridentata*)	1750±120	AD 240±140
CR3815-2	RL 1749	B.H.T. 1, Fea. 1, Hearth	charcoal (*Artemisia tridentata*)	8230±540	---
CR3815-3	RL 1750	T.U. 2, Level 6, Fea. 3, Hearth	charcoal (*Artemisia tridentata*)	8210±260	---
CR3815-4	RL 1751	T.U.1, Fea. 1, Hearthe	charcoal (*Artemisia tridentata*) & (*Populus* sp.)	1170±100	AD 800±120
CR3815-7	RL 1802	T.U. A, Fea. 1, Hearth	charcoal (*Artemisia tridentata*)	4430±230	3200BC±270
CR3815-8	RL 1824	Area A, X.U. 2, Fea. 2	charcoal (*Artemisia tridentata*)	9150±810	---
CR3815-10	RL 1825	T.U. 2, Level 7, Feature 4, Hearth	charcoal (*Artemisia tridentata*)	8780±260	---
CR3815-5	Beta 11886	X.U.4, Fea. 1	charcoal (*Artemisia tridentata*)	6570±130	---

RL=Radiocarbon LTD, Lampasas, Texas; Beta=Beta Analytic, Coral Gables, Florida
T.U.=Test Unit; Fea.=Feature; B.H.T.=Backhoe trench; X.U.=Excavation Unit

APPENDIX 4

FLOTATION ANALYSIS OF MACROFLORAL REMAINS

By

Keith Dueholm

APPENDIX 4

FLOTATION ANALYSIS OF MACROFLORAL REMAINS

Keith Dueholm

Flotation procedure involved the use of two wash tubs, a 20 gallon (75.7 l) tub, and a second smaller tub which fit inside the first. The bottom had been removed from the smaller tub and was replaced with fine mesh (40#) screening. Water was added to the smaller tub as it fit inside the larger and the sample was added. Agitation of the smaller tub allowed fine soil particles to sift through the screen, leaving behind a "heavy fraction" of pebbles and organic material which was examined for chipped stone artifacts and macrofloral remains. Organic material also floated on the water surface. This "light fraction" was removed with a very fine mesh fish net and allowed to dry. It was then examined under a 9x dissecting microscope. Seeds, fruits and related structures were removed and stored in gelatin capsules. The seeds or fruits were then identified by use of a reference seed collection in the author's possession, located at the Rocky Mountain Herbarium, University of Wyoming. Notes were taken to indicate the condition of the seeds or fruits (e.g. charring). Charred wood in the sample was also identified using wood identification guides (Core et al. 1976). Reference material in the authors possession was utilized for shrubs not covered in such guides.

Information on distributions of certain taxa is taken largely from distribution maps at the Rocky Mountain herbarium and from the author's personal knowledge of the flora of southern Wyoming. The amount of wood which is charred in the samples is not quantified, but is ranked along a qualitative scale. There are five basic categories along this scale, represented by the following estimated amounts of charred wood (in cubic centimeters, cc): small, 10 cc; fair, 25 cc; good, 75 cc; large, 150 cc; and huge, 250 cc or greater. Intermediate amounts are found in some samples, and modifiers may indicate further information (e.g. very small, much less than 10 cc of charred wood). It can be assumed the items listed are charred, unless otherwise indicated.

Results and Discussion

Twenty-five samples were analyzed for macrofloral remains from the project, two from 48CR3812, two from 48CR3814, and the remainder from 48CR3815. The results are presented by site below, with comments following appropriate samples.

48CR3812
Test Unit 1, Level I
samples taken 7/13/82
Outside hearth

few small pieces of wood, probably *Artemisia tridentata* (big sage)
no seeds

Within hearth

fair amount of wood, Artemisia tridentata
Oryzopsis hymenoides fruit - 1/2, not charred
possible Boraginaceae (Lithospermum ? sp.) fruit - 1, not charred, fragmented
Atriplex sp. (saltbush) seeds - 5 (1 very huge), not charred, apparently aborted
Polygonum (knotweed) or Rumex (dock) sp. fruit - 1, apparently slightly charred
Unknown fruit fragments 2, not charred

The noncharred, occasionally aborted condition of most of the seeds or fruits probably indicates they are modern obtrusives.

48CR3814
Firepit #1 collected during monitoring of road grading
Cat. #CR3814-3
sample taken 8/11/82

analysis of heavy fraction - 2 small pieces of wood
analysis of light fraction - small amount of wood, Juniperus sp. (juniper), no seeds

48CR3814
Firepit #2 collected during monitoring of road grading
Cat. #CR3814-4
sample taken 8/11/82

analysis of heavy fraction - small amount of wood
analysis of light fraction - fair amount of wood, apparently Juniperus sp., no seeds

The wood from these two samples is likely to be Rocky Mountain juniper (J. scopulorum), although some Utah juniper may occur in the region (J. osteosperma). Either species would most likely be found on rocky hillsides or similar situations.

48CR3815
T.U. 1, Feature 1, soil sample
sample taken 8/25/82

huge amount of wood, Artemisia tridentata and Populus sp. (cottonwood or aspen)
Chenopodium sp. (goosefoot) seeds - 8, slightly charred or apparently fire-popped
Carex sp. trigonous fruit - 1, not charred
Carex sp. lenticular fruit - 1
Suaeda sp. (seablite) seeds - 2
Monolepsis nuttalliana (povertyweed) seed(?) - 1, partly fragmented and in poor condition
Oryzopsis hymenoides (Indian ricegrass) fruit - 1, not charred

48CR3815
T.U. 1, Feature 1
E½ of hearth
sample taken 8/25/82 (sample consists of three bags, each with a huge amount of material)

- very huge amount of wood, mostly Artemisia tridentata, and a fair amount of Populus sp. (large size)
- Chenopodium sp. seeds - 42
- Monolepis nuttalliana seeds - 6
- Carex sp. trigonous fruit - 1
- Scirpus sp. (bulrush) lenticular fruit - 2, 1 not charred
- Eleocharis sp. (spikerush) lenticular fruit, with stipe - 1
- Atriplex sp. (saltbush) seed - 1
- Atriplex sp. fruit, in hardened calyx - 4, not charred, obtrusive 1 charred fragment
- possible fragment of Cryptantha sp. (miner's candle) fruit - 1
- Leguminosae (Astragalus(?) (milk vetch) seed - 1
- Rosaceae (Rose family) seed - 1
- possible Compositae (Composite family) fruit - 1, 2.0 x 1.5 mm, flat, to slight concave on one side, slightly asymmetrical
- Unknown oval seed - 1, ca. 1 mm
- Arenaria hookeri (Hooker's sandwort) flower and calyx - 1, not charred, obtrusive

Since this and the preceding sample are from the same feature, they will be discussed together. These two samples, especially the second, are the most productive of any from 48CR3815. They have an enormous amount of wood, chiefly Artemisia, but also a good deal of Populus sp. The Artemisia is not surprising, being prevalent throughout Wyoming. The Populus is likely to be P. angustifolia (narrow-leaved cottonwood), found in foothills and along streams at the present time in the general area. Aspen (P. tremuloides) does occur in the mountains south of the area, but probably at a greater distance than the cottonwood.

Many of the taxa recovered have been used historically for food. These include Chenopodium, Monolepis, Eleocharis, Scirpus, Suaeda, Atriplex and Carex (Chamberlin 1911; Gilmore 1919; Harrington 1967; Steward 1938; Yanovsky 1936). Although most of these occur in small numbers, possibly indicating local contaminants during site occupation, the Chenopodium occurs in relatively large quantity. In fact, this taxon has been sown broadcast around occupation sites (Steward 1938), providing a ready source of potherbs and seeds. The other taxa have been used in various ways: as potherbs (Atriplex, Monolepsis); roots and stems (Carex, Eleocharis, Scirpus) and seed sources (all taxa, except possibly Carex, the use of which seems to have been limited to stems (Chamerlin 1911; Yanovsky 1936). Since it is a graminoid, however, it may have been used in lining hearths.

Some of the taxa are currently characteristic of alkaline habitats, such as Atriplex and Suaeda (Porter 1968) or otherwise wet, or seasonally wet, habitats, such as Eleocharis, Scirpus and most species of Carex. Chenopodium can be found in a variety of habitats, both wet or dry, depending on species (Porter 1968).

48CR3815
T.U. 2, Feature 2, Level 3
soil sample taken within hearth
sample taken 8/18/82
very small amount of wood, Artemisia tridentata
probably Amaranthus sp. (pigweed) seed - 1, not charred, obtrusive

48CR3815
T.U. 2, Feature 2
soil sample in rock pile above hearth
sample taken 8/18/82
small amount of wood, Artemisia tridentata
no seeds

48CR3815
T.U. 2, Feature 3, Level 6
sample taken 8/21/82
fair amount of wood, Artemisia tridentata
no seeds

48CR3815
T.U. 3, Feature 1, Level 1
soil sample from NE¼ of hearth
sample taken 8/20/82
large-huge amount of mostly small wood, mostly Artemisia tridentata, possibly some very small Populus sp.
Monolepis nuttalliana seeds - 2, slightly charred
Suaeda sp. seed - 1, slightly charred
Cryptantha nutlet - 1, not charred, obtrusive, very fragile
Polygonum sp. (?) (knotweed) fruits - 4, not charred, probably obtrusive

48CR3815
T.U. 3, Feature 1, SW¼ of hearth
sample taken 8/20/82
large amount of wood, Artemisia tridentata
Polygonum or Rumex (dock) fruits - 11, slightly charred (?)
Atriplex fruit fragments - 3, not charred
possibly Rubus (raspberry) fruit fragment - 1, not charred
Agropyron sp. (wheatgrass) fruit - 1, not charred
possible Potentilla sp. (cinquefoil) fruit - 1
Unknown seeds - 3, possible aborted Polygonum or Rumex, not charred

The last two samples have a fair amount of seeds present, but most of them are uncharred, are few in number for each taxon, and are probably modern obtrusives. The Polygonum or Rumex fruits in the second sample appear slightly charred, so may have been contempoary with the site's occupation. Members of either genera have been used historically as food (Harrington 1967; Yanovsky 1936). The genus Potentilla is primarily an upland genus, often found in foothills and mountain meadows, with a few species occurring in plains situations. One species, P. anserina, is commonly found along streams or intermittent drainages, and is reported to be edible (Harrington 1967). As mentioned above, the Populus sp. wood is probably from P. angustifolia.

48CR3815
Area A, X.U. 2, Feature 2, Level 5
sample taken 10/7/82
    fair amount of wood, Artemisia tridentata
    no seeds

48CR3815
Area B, X.U. 6, Feature 1
sample taken 10/5/82
    good amount of wood, Artemisia tridentata
    no seeds
Heavy fraction
    bud bract of Populus sp., 1.4 cm long, charred (indicating spring enlargement of bud)

48CR3815
Area B, X.U. 6, Feature 1
sample taken 10/5/82
    fair amount of wood, Artemisia tridentata
    Atriplex seed fragment - 1, not charred, probably obtrusive

48CR3815
Area B, X.U. A
soil sample from 120-130 cm bd from Feature
S½ pit center
sample taken 10/13/82
    small amount of wood (but most of sample), Artemisia tridentata
    no seeds
Heavy fraction
    Prunus virginiana endocarp fragments - ca. 8 halves, and 17 smaller fragments

48CR3815
Area B, X.U. A
140-150 cm bd
Feature 5
sample taken 10/14/82
    good amount of wood, Artemisia tridentata
    no seeds
Heavy fraction
    2 wood samples, about 1/2 and 1/2 Artemisia tridentata and Populus sp. wood
    no seeds

48CR3815
Area B, X.U. A, Feature 1
sample taken 9/2/81
    small amount of wood, Artemisia tridentata
    no seeds

48CR3815
Area B, X.U. 3,
soil sample from outside of Feature 1
(25 cm bd)
sample taken 9/2/82
very little wood, Artemisia tridentata
no seeds

48CR3815
Area B, X.U. 3, Feature 1 (soil)
sample taken 9/2/82
small amount of wood, Artemisia tridentata
no seeds

48CR3815
Area B, X.U. 3, Feature 2, soil sample
from outside of Feature, 60 cm below surface
sample taken 9/6/82
very little wood, Artemisia tridentata
no seeds

48CR3815
Area B, X.U. 3, Feature 2
sample taken 9/6/82
good amount of wood, Artemisia tridentata
possible Boraginaceae fruit - 1
possible seed fragment of Oryzopsis hymenoides (Indian rice-grass) - 1
Suaeda sp. seed - 1, not charred

Oryzopsis hymenoides has been reported as a historical food source of some importance (Harrington 1967, Steward 1938), the fruit being scorched in fires then ground.

48CR3815
Area B, X.U. 3, 'gravel' area, Level 2
soil sample taken at 20-25 cm below surface
sample taken 9/2/82
almost no wood, Artemisia tridentata
no seeds

48CR3815
Area B, X.U. 4, Feature 1
soil sample of hearth (large sample, only a portion of it was sampled) -
fair amount of wood, Artemisia tridentata
no seeds

48CR3815
Area A, X.U. 2, Feature 2, Level 4, 60 cm bd
sample taken 9/4/82
large amount of wood, mostly Artemisia tridentata (big sage), a small fraction is too small for identification
fragments of possible Prunus sp. (chokecherry) fruit - 2 (probably P. virginiana)

The fruits of chokecherry were widely used prehistorically (e.g. Harrington 1967; Grinnell 1923; Steward 1938), either eaten raw or ground and mixed with meats. The fruits consist of a fleshy, juicy layer surrounding a hard, bony endocarp. It is fragments of the latter that appear in the sample. Since they are present as fragments, they may indicate potential grinding, but the presence of so few pieces leaves a great deal of uncertainty in this interpretation. Chokecherry is presently widely distributed throughout Wyoming, being found on protected slopes where moisture may accumulate, or along more permanent streams.

General Discussion

It is of interest that while big sagebrush is present in all samples from 48CR3815, it is absent from the two samples from 48CR3814. The moderate to small amounts of wood in these samples is apparently juniper (which in turn was not recovered from 48CR3815). Reasons for this discrepancy are not known, but may involve availability of local fuel sources or actual selectivity in choosing a fuel source, which may be affected by the purpose for which the fires were constructed. It should be noted that no seeds were recovered from the two samples from 48CR3814.

Seeds, fruits or related floral structures from over 20 taxa were recovered from eight of 13 samles from 48CR3815. Many of the taxa were charred, including Prunus (ca. 10 fruits), Chenopodium (50 seeds), Carex spp. (8 fruits), Polygonum or Rumex (11 slightly charred fruits), Monolepis (9 seeds), Suaeda (3 seeds), Atriplex (2 fruits or seeds) and Oryzopsis, Eleocharis, Scirpus, Cryptantha (?), Astragalus (?), Potentilla (?), Boraginaceae, Compositae and Rosaceae (1 seed or fruit each). Even though a variety of taxa are represented in the samples, only two features have more than three charred seeds, fruits, etc. These are Feature 1 in T.U. 1 (75 seeds, etc. charred) and Feature 1 in T.U. 3 (12 slightly charred seeds, etc.). The first of these has a variety of taxa present, especially Chenopodium, which have been used historically as food resources. Also, Chenopodium was recovered only in the samples from this Feature and not in any of the remaining samples from 48CR3815. Since this genus is usually one of the most frequently encountered seeds recovered from sites in southern Wyoming (Benz 1983; Coulam and Barnett 1980; Moe et al. 1983; Mathews 1979, and this author, unpublished data), its presence in only one feature here is interesting. This fact, along with its relative abundance, and the association of several other edible taxa may indicate vegetal food processing or preparation at this Feature.

The seeds, etc. recovered from the remaining samples, with the possible exception of Feature 1 in T.U. 3, as discussed briefly above, are probably best interpreted as recent contaminants or, if charred, contaminants from local plants at or near the site at the time of site occupation, especially in light of the small numbers recovered from the samples.

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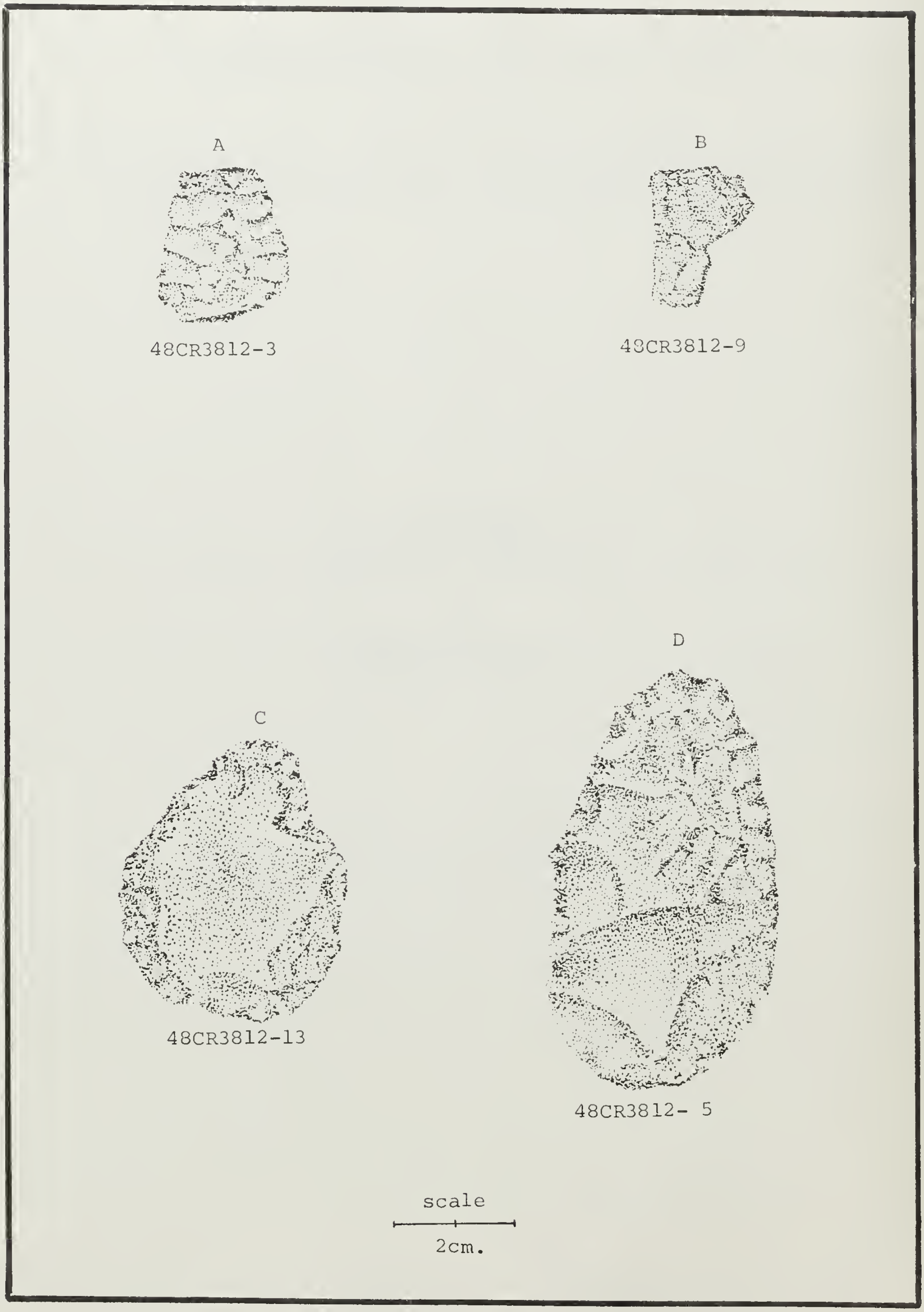
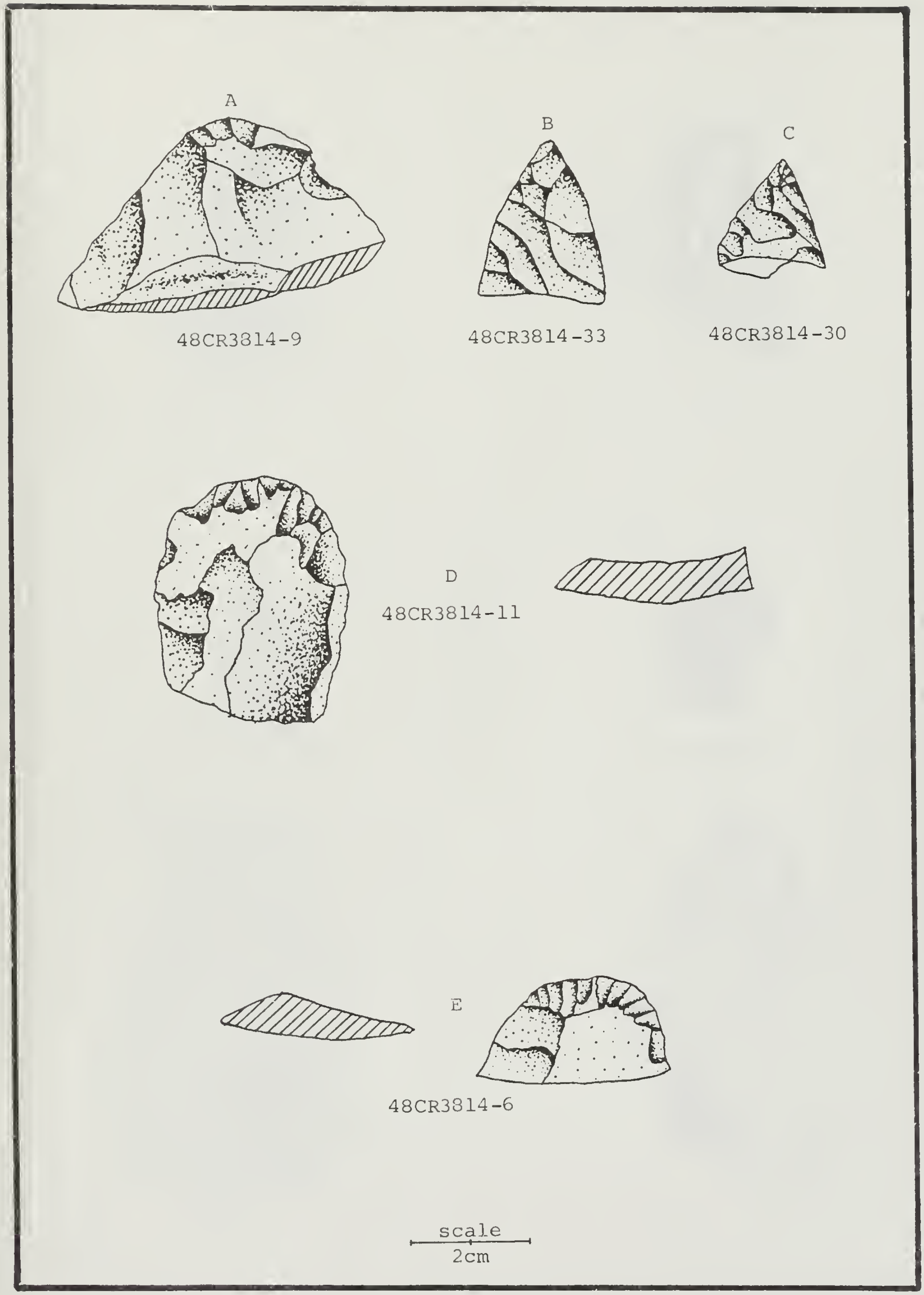
APPENDIX 5
ARTIFACT ILLUSTRATIONS

By

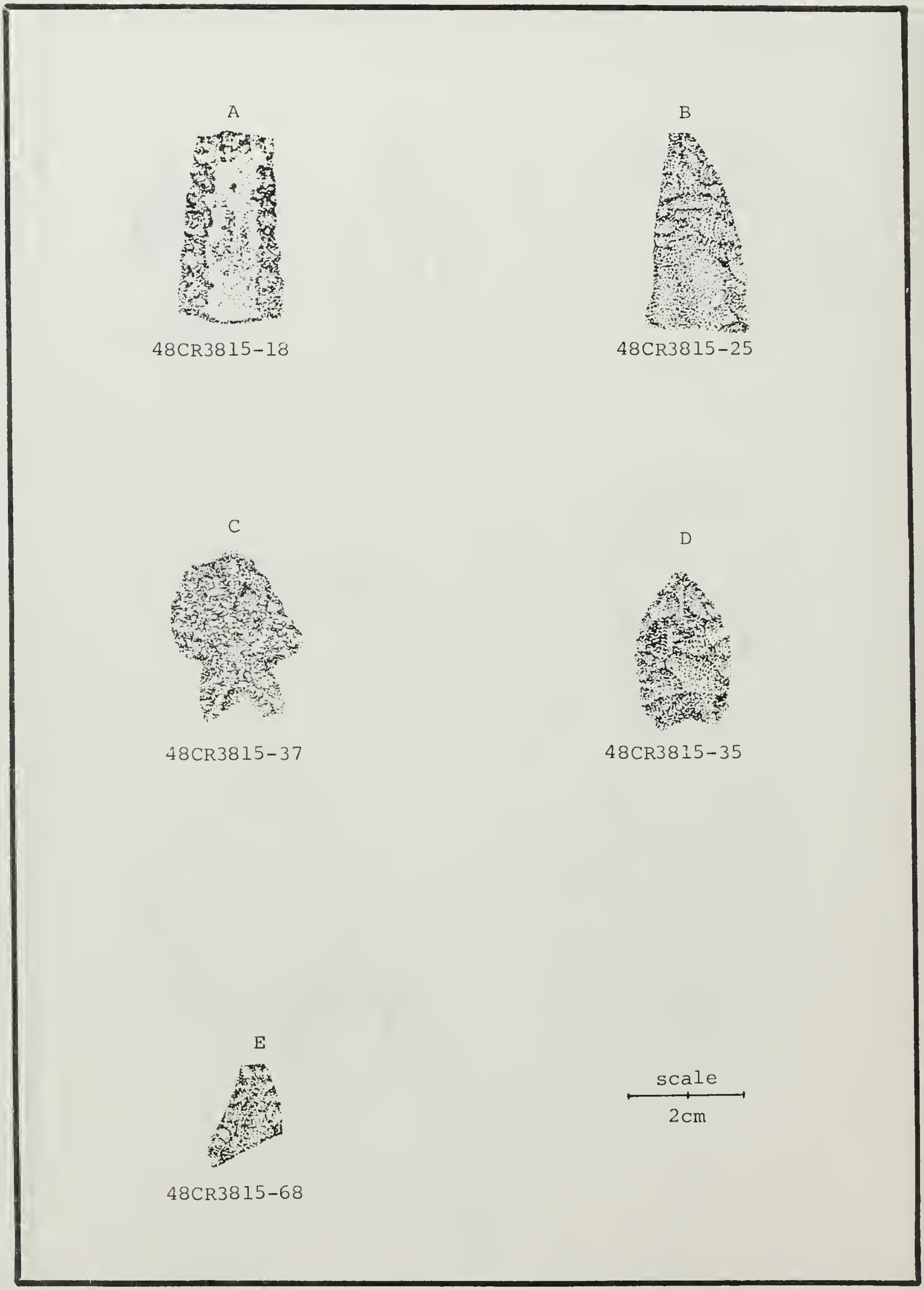
Allen Darlington
Julie Eakin



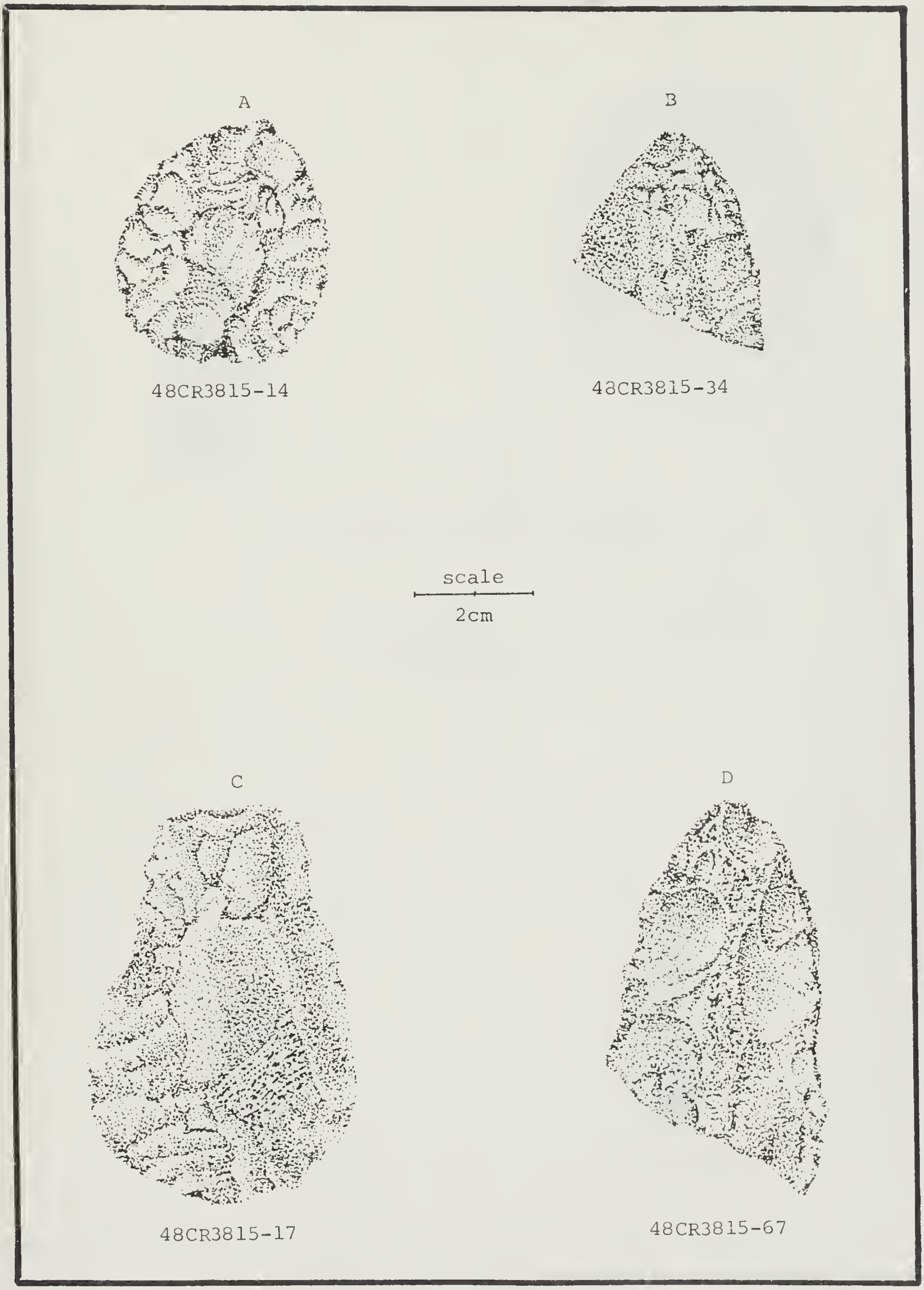
48CR3812; A-B) projectile point fragments, C-D) bifaces.



48CR3814; A-C) biface fragments, D-E) end scrapers.



48CR3815: Surface; A-B,E) biface fragments, C) Hanna/Middle Archaic point, D) McKean lanceolate point.



48CR3815: Surface; A-D) bifaces.

48CR3815: Buried artifacts; A) biface fragment, B) Early Archaic side notched point, C) corner notched projectile point, D) Late Archaic corner notched point.

APPENDIX 6

LIST OF FAUNAL MATERIAL IDENTIFIED AT THE SAGE CREEK SITE, 48CR3815

By

David G. Eckles

Catalog #	Provenience	Species	Element	Cultural Modification	Age	Number	Size
CR3815-99	T.U. 2, Level 6 40 cm N, 20 cm E	Unknown	Unknown Fragment	None	--	3	4.0 x 4.0 mm
CR3815-102	T.U. 2, Level 8	*Crotalus* sp. (rattlesnake)	Lumbar vertebra	None	Mature	1	6.0 x 5.0 mm
CR3815-126	T.U. A, Area A	Small vertebrate	Vertebra fragment?	None	--	1	8.0 x 4.0 mm
CR3815-127	T.U. A, Area A	Unknown	Unknown fragment	None	--	1	8.5 x 5.5 mm
CR3815-158	T.U. 1, Area A	Small mammal	Vertebra fragment	None	Immature	1	10.0 x 8.0 mm
CR3815-158	T.U. 1, Area A	Small mammal	Rib fragment	None	--	1	7.0 x 5.0 mm
CR3815-159	T.U. 1, Area A	Small mammal	Vertebra fragment	None	Immature	1	15.0 x 12.0 mm
CR3815-165	T.U. 1, Area A	Medium-large mammal	Long bone shaft fragment	Burned, spiral break	--	1	19.0 x 12.0 mm
CR3815-173	T.U. 1, Area A	cf. *Spermophilus* sp.	Right scapula	None	Mature	1	22.0 x 9.0 mm
CR3815-188	X.U. 3, Area A	Small-medium mammal	Long bone fragment	None	--	1	11.0 x 10.0 mm

APPENDIX 7
RAW MATERIAL AND ARTIFACT DEFINITIONS

By

William R. Latady, Jr.
Jeanne Moe
Sandra Todd

All artifacts collected in the field were transported to the Department of Anthropology, University of Wyoming for cleaning, cataloguing and analysis. These artifacts are presently curated at the Department of Anthropology, University of Wyoming.

Tools

Projectile Point

Projectile points are defined as formally flaked artifacts that have modified proximal or basal ends. This modification may take the form of corner, side or basal notching. Points without notches most often display grinding on basal and lateral edges near the proximal end (Chapman 1977:413).

Biface

Bifaces are defined as bifacially flaked artifacts that lack basal modification for hafting (Chapman 1977:412; House 1975:61). Generally, bifaces are larger and thicker compared to finished points. Shapes may be oval, triangular or rectangular. Bifaces could have been used for cutting, sawing or light-duty chopping. They may also have functioned as bifacially reduced artifacts associated with the stage in projectile point (or other bifacial tool) manufacture prior to the fashioning of the preform.

Scraper

Scrapers are defined as unifacially flaked artifacts which display a very steep, straight to convex working edge. Two types of scrapers are usually distinguished: end and side scrapers. End scrapers have the working edge perpendicular to the axis of the flake, while side scrapers have the working edge parallel to the axis of the flake.

Retouched Flakes

A retouched flake has an observable pattern of flake removal. The modified edge(s) shows flake scars that are closely grouped and are approximately the same size. The pressure applied to detach the flakes causes "a negative scar which feathers at its distal end. This results in an essentially smooth transition between the distal position of the resultant debitage scar and the original surface of the artifact" (Chapman 1977:383). A retouched flake has been deliberately modified for a specific purpose, such as altering the shape of the edge, increasing its tensile strength, or resharpening it (Chapman 1977:378).

Utilized Flakes

A utilized flake exhibits a pattern of flake removal from one or more of its edges. This is produced by utilization rather than intentional modification. The flake scars are small, irregular and poorly defined, and have relatively little effect on the outline of the flake (House 1975:64). These are usually step fractures or attrition on the edge perimeter itself (Chapman 1977:386).

Manos and Metates

Mano and metate are terms used to describe the two types of ground stone often found at archaeological sites. Manos are cobble sized, often water rounded, pieces of quartzite, granite or other hard rock. This tool was gripped in the hand and used to crack and grind vegetable foods on a metate, a larger, flatter piece of sandstone, granite or other hard rock. The mano characteristically has one or more smoothed surfaces; the metate often has a groove worn into it.

Hammerstones

Hammerstones are generally cobble sized rocks used for hammering or pounding. They are generally unflaked and can be distinguished by battering and crushing wear on a lateral margin. Hammerstones are quite often used in the manufacture of chipped stone artifacts.

Cobble Tool

A cobble tool is a large cobble (generally quartzite) that has had one or two flakes removed from a lateral margin. Quite often, the flakes edge exhibits battering or crushing edge wear. These tools may have been used as heavy duty chopping implements or were quartzite cobbles which were tested to determine raw material quality.

Core

A piece of lithic raw material which has been modified by the removal of smaller segments of the raw material, i.e., flakes. The parent material must have at least a striking platform from which force can be directed (Chapman 1977:375).

Tested Cobble

This is a cobble of siliceous material which was apparently selected as a potential lithic artifact source. For some reason, the material was found to be inadequate for knapping. These cobbles are considered to have been tested and discarded (Hickman 1983:88).

Debitage

Flake

Flakes are the debris produced during core reduction and tool manufacture. Debitage is a term used to refer to flakes that are waste products of tool manufacture and receive no further modification. Three different types of flakes have been distinguished.

Primary flakes are unmodified flakes produced from core reduction with between 75% and 100% cortex on the dorsal surface. Often it is a thick, blocky flake with a large striking platform. The platform is often unprepared and may be cortex covered. Cortex is the outer weathered surface or rind of rock (Francis 1983:102).

Secondary flakes are unmodified flakes produced from core reduction with between 75% and 1% cortex on the dorsal surface and/or one or two dorsal flake scars. It is often a thick flake with a large unprepared striking platform (Francis 1983:102).

Tertiary flakes are unmodified flakes produced from core reduction with no cortex on the dorsal surface and/or three or more dorsal flake scars. These flakes are indicative of final core reduction and tool manufacture (Francis 1983:102).

Shatter is unmodified angular debris with no definite flake attributes, such as a striking platform or bulb of percussion (Francis 1983:102).

Lithic Raw Material Categories

Raw material categories are broad because of the difficulty in distinguishing chert and chalcedony, without more sophisticated analytical processes than were considered appropriate for a project of this nature. Eleven raw material types were identified in the collections from the sites investigated during this survey. These are described below.

Bioclastic Chert

This chert is primarily composed of fragmented remains of organisms. These remains generally consist of small broken pieces of shell. THe matrix ranges in color from off white, to dark brown, to gray, to gray and purple banded. However, weathering can produce an orange tint on the exposed surface or surfaces. The cortex is rough textured and usually dark brown.

Outcrops of this material occur within the Green River Formation in the Washakie Basin. It is found as desert pavement on the wind eroded surfaces of interdunal areas (Michaelsen 1983:13).

Oolitic Chert

This chert consists of concentric laminae of calcium carbonate surrounding some nucleus such as quartz or a shell fragment. The matrix ranges in color from light brown to dark brown with the oolites generally lighter in color. The cortex of the oolitic chert is rough textured and ranges in color from tan to dark brown (Michaelsen 1983:13).

Oolitic cherts outcrop within the Green River Formation. The outcrops are laterally discontinuous and are confined in strandline deposits of the Eocene Lake Gosiute (Surfam and Wolfbaur 1975:343).

Non-dendritic Chert

Most cherts without dendritic inclusions, regardless of color, are contained in this category. This includes translucent specimens commonly designated as chalcedony. Colors cover every range of the spectrum from translucent white to dark brown. Some of this raw material type may come from the Mississippian age Formations exposed throughout Wyoming. However, this material is often locally available on terraces as cobbles and gravels.

Dendritic Chert

The dendritic cherts were designated as a separate category because of the possibility that they originated in the Madison Formation. This Formation is a well known source of high quality cherts, most of which contain dark dendritic inclusions. It was hoped that by making this distinction, it might be possible to isolate a regional source of lithic procurement. Although undoubtedly not all the cherts in question came from the Madison formation, they are most likely Mississippian in age.

Morrison Quartzite

This material derives its name from the Morrison Formation of the Upper Jurassic age in both the Big Horn Mountains and the Black Hills. This quartzite is fine grained and usually grey, but may also occur in shades of yellow, rust or maroon (Francis 1983).

Quartzite

This is a medium to coarse-grained material that ranges in color from shades of white and grey to brown and red. These quartzites are available locally in cobbles and gravels which are found throughout the basin.

Siltstone

This raw material type consists of a light tan porous rock with small grain structure. It absorbs water readily and has a distinctive "earthy" smell.

Obsidian

This material is formed by volcanic lavas which have cooled so quickly that crystals have not had time to form. Obsidian is characterized by its glassy texture (Loomis 1923:191-192). The obsidian found in Wyoming is usually a translucent dark grey or black. Love (1977) has observed obsidian pebbles in the western edge of the Green River Basin. However, at this time, no precise source area for the pebbles has been located.

Non-Volcanic Glass

This material was formed when coal beds ignited and essentially formed a natural glass from parent materials (Frison 1974). It is a distinctive material having a sandy appearance when flakes. According to Frison (1974:61) "The colors are distinctive and range from a light gray to several shades of green to maroon and black. Small specks of slag are usually, but not always, noticeable. Under the microscope, the grays and maroons are characterized by particles of colored material suspended in a clear matrix." Non-volcanic glass has been found in small pockets of burned-out coal beds in northeastern Wyoming and southeastern Montana. Known quarries of this material are located near Sheridan, Wyoming, and between the Tongue and Powder Rivers, 19.2 km from the Montana border (Frison 1974:61). Although no sources are known to occur in southern Wyoming, evidence of burned-out coal beds has been found southeast of Creston Junction, Wyoming. This area is only about 32 km northwest of the project area.

Phosphoria Chert

This is a high quality cryptocrystalline chert ranging in color from shades of red to blue or nearly white (Francis 1983:42). Sources occur in several sedimentary formations of Permian age in the Bighorn Mountains. They occur as surface exposures or small outcrops of nodules. Quarries of high quality cherts of this type have also been recorded in the Absarokas, the Black Hills and at Cross Mountain near Craig, Colorado (Gardner *et al*. 1983).

Sandstone

Sandstones are formed by the consolidation of sand and gravel into rock masses. This material was commonly used for grinding stones by aboriginal populations.

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