COLORADO PREHISTORY:

A CONTEXT FOR THE PLATTE RIVER BASIN

Kevin P. Gilmore, Marcia Tate, Mark L. Chenault, Bonnie Clark, Terri McBride, and Margaret Wood

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by

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The cover shows a shield figure pictograph found at the Bonner Spring Rock Art Site. The design was adapted and drawn by Bill Tate from photographs and sketches made by Steven Main of CSU, the site recorder.

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FOREWORD

The Colorado Historical Society is pleased to support the publication of the Prehistory of Colorado series. This set of volumes fills a vital need for background material that synthesizes our gray literature and provides contexts for evaluating new discoveries in our State:

Colorado Prehistory: A Context for the Arkansas River Basin, by Christian J. Zier and Stephen M. Kalasz.

Colorado Prehistory: A Context for the Northern Colorado River Basin, by Alan D. Reed and Michael D. Metcalf.

Colorado Prehistory: A Context for the Platte River Basin, by Kevin Gilmore, Marcia Tate, Mark Chenault, Bonnie Clark, Terri McBride, and Margaret Wood.

Colorado Prehistory: A Context for the Rio Grande Basin, by Marilyn A. Martorano, Ted Hoefer III, Margaret (Pegi) A. Jodry, Vince Spero, and Melissa L. Taylor.

Colorado Prehistory: A Context for the Southern Colorado River Basin, by Crow Canyon Archaeological Center.

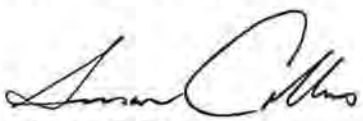
We commend the Colorado Council of Professional Archaeologists (CCPA) for completing this project, just as they were instrumental in beginning the regional research design series published by our Office of Archaeology and Historic Preservation in 1984. The past fifteen years have seen an explosive growth in information about our shared past, and the turning of the millennium gives a symbolic opportunity to reassess our understanding of ancient Colorado.

A grant from the State Historical Fund enabled the CCPA to undertake this project, and all volume authors donated great amounts of their professional time during the two-year course of this project. These individuals and their businesses have made investments in knowledge. We are grateful to them for their efforts and for sharing what they have learned.

The CCPA grant advisory board, consisting of Sandra Karhu (Chair), William Killam, Steven Lekson, Gordon Tucker, Douglas Scott, and Margaret Van Ness, guided the development of the project. Susan Chandler served as project manager. A large committee of CCPA members offered peer review — namely, Dan Jepson, OD Hand, Melissa Connor, Marilynn Mueller, Pete Gleichman, Doug Bamforth, Bob Brunswig, Jeff Eighmy, Martin Weimer, Mark Stiger, Bruce Jones, Joanne Sanfilippo, Kevin Black, Todd McMahon, Betty LeFree, Steve Lekson, and Al Kane.

Within the Colorado Historical Society, Margaret Van Ness advised CCPA on project planning; Kevin Black and Todd McMahon served as peer reviewers; and Julie Watson and Jay Norejko offered helpful comments on drafts.

This series of five volumes provides a new platform for understanding the long and complex history of Colorado. Improved knowledge about the complexity of past lifeways can help us to appreciate our common human heritage. We look forward to continuing partnership in our shared quest for discovery!



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Chapter 1

INTRODUCTION

Mark L. Chenault

The purpose of this manuscript is to present a prehistoric context for the archaeology of the northern half of the Colorado plains, with the addition of the foothills and mountains up to the continental divide (Figure 1-1). In this respect, it is the offspring of the *Colorado Plains Prehistoric Context* (Eighmy 1984) the *Colorado Mountains Prehistoric Context* (Guthrie et al.1984), and the Multiple Property Listing (Gleichman and Gleichman 1989). The designers of the current undertaking, however, were merciful and saw fit to make this task somewhat less monumental than that of the above authors, especially Eighmy's, by dividing the Colorado plains into the Platte and Arkansas River basins. This reduced the size of the database to a somewhat more manageable level.

THE PLATTE RIVER BASIN

The Platte River Basin encompasses the area drained by the South Platte River. For the purpose of this context, though, the northern boundary of the study area is the Colorado-Wyoming-Nebraska border. The eastern boundary is a similarly artificial one: the Colorado-Nebraska-Kansas border. On the west, the Platte River Basin ends at the Continental Divide. In the northern part of the study area, the divide is located almost as far west as Steamboat Springs. From there it runs east to Rocky Mountain National Park (RMNP) and then south to just east of Winter Park. From there the divide again swings west past Leadville. The southern boundary of the study area is the northern edge of the Arkansas River Basin, which for the purposes of this report is a line that runs east through the upper portion of Teller County, to the point where Lincoln, Kit Carson, and Cheyenne Counties meet, and then southeast to the Colorado-Kansas border.

Because prehistoric occupation in the region was somewhat different depending on terrain, we have separated the Platte River Basin into three regions: the Plains, Foothills, and Mountains (see Chapter 2). These divisions are fairly straightforward and are shown on the base map (Figure 1-2) and on site-distribution maps throughout this volume.

CULTURAL UNITS AND SYSTEMATICS

In order to allow comparisons between the Platte River Basin and the Arkansas Basin, we have attempted to use the same nomenclature and taxonomy as the authors of the context of the region directly to the south of ours. Our largest temporal and cultural division is the stage, with the Paleoindian, Archaic, Ceramic, and Protohistoric stages applying to both the Platte River and Arkansas River Basins. The stages are chronologically ordered, and each stage encompass one or more periods. Periods are distinguished by technological attributes, particularly changes in attributes, and in some cases by differences in subsistence strategies. The example presented in

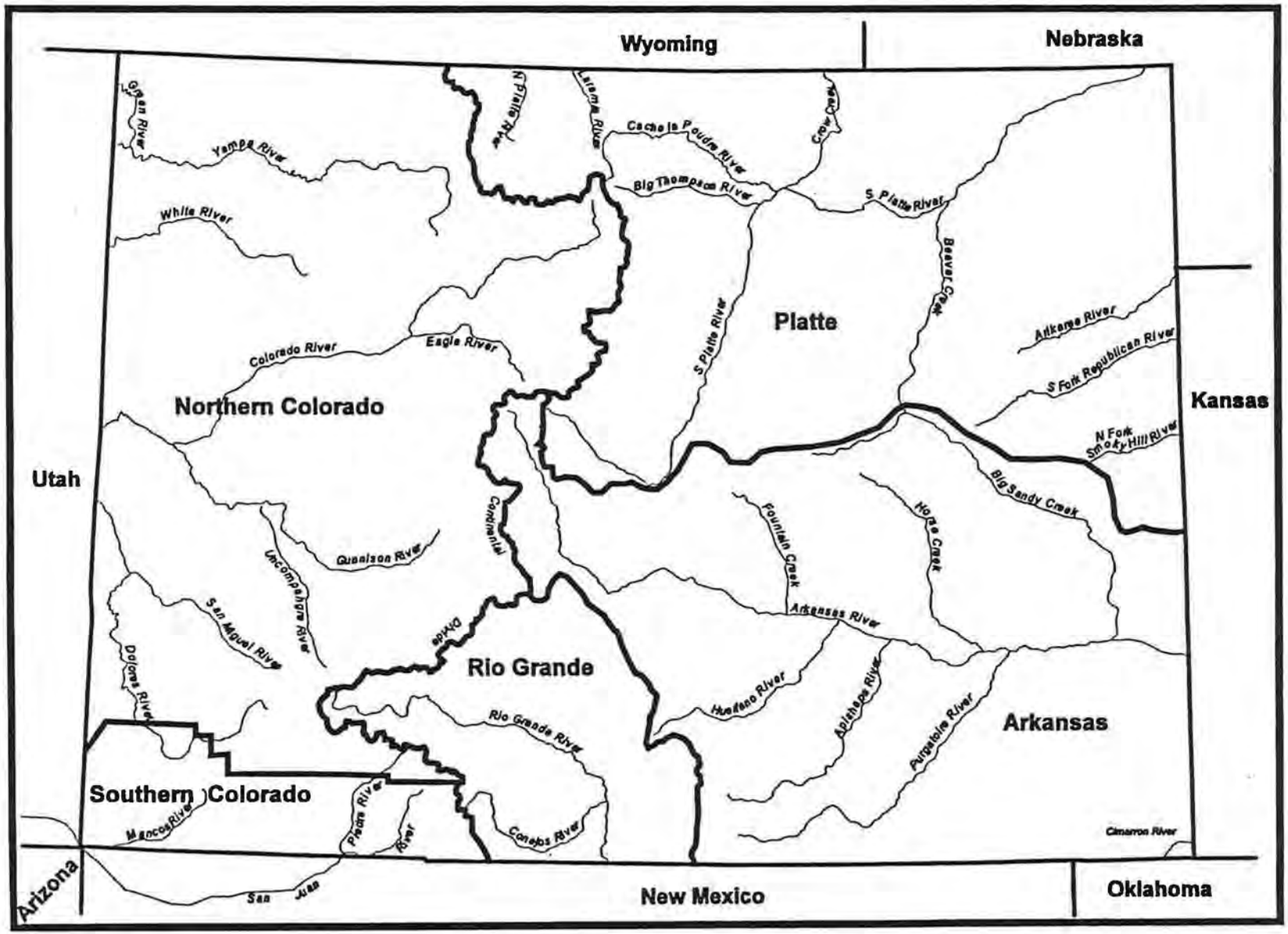

Figure 1-1. Map of the Colorado context regions.

the Arkansas River Basin context, and reiterated here, is that the presence of hunted mammoth remains is indicative of the Clovis period of the Paleoindian stage.

The Paleoindian stage encompasses the Clovis, the Folsom, and the Plano periods, in that chronological order. It has been posited that those periods are preceded by a pre-Clovis period, but there is no evidence to support this. The Archaic stage is divided into the Early, Middle, and Late Archaic. It is in the next stage, the Late Prehistoric stage, that we diverge from the Arkansas Basin context. The authors of the Arkansas context have had to deal with a more complex situation than ours, and one with which our data are not parallel; analogs of the Sopris and Apishapa are not found in the Platte River Basin. Instead, we use the terms Early and Middle Ceramic to describe the Late Prehistoric in the Platte River Basin. We do, however, join up again with the Arkansas Basin authors with the final stage, the Protohistoric. Table 1.1 presents our chronology for the prehistory of the region, and Figure 1.2 is a histogram of radiocarbon dates from the Platte River Basin.

Table 1.1. Prehistoric chronology of the Platte River Basin

Stage	Period	Date Range
Paleoindian		12,000 — 5500 B.P.
	Clovis	12,000 — 11,000 B.P.
	Folsom	11,000 — 10,000 B.P.
	Plano	10,000 — 7500 B.P.
Archaic		7500 B.P. — A.D. 150
	Early Archaic	7500 — 5000 B.P.
	Middle Archaic	5000 — 3000 B.P.
	Late Archaic	3000 B.P. — A.D. 150
Late Prehistoric	Early Ceramic	A.D. 150 — 1150
	Middle Ceramic	A.D. 1150 — 1540
Protohistoric		A.D. 1540 — 1860

Stages in the Platte River Basin

Descriptions of the Paleoindian, Archaic, Ceramic, and Protohistoric stages form the bulk of this context report. Following a discussion of the environment by Marcia Tate in Chapter 2, and a brief discussion of theory and research topics by McBride, Wood, Gilmore and Chenault in Chapter 3, the next four chapters cover the cultural stages in the Platte River Basin. The final chapter is a discussion by Terri McBride of modern Native American concerns as they relate to the basin.

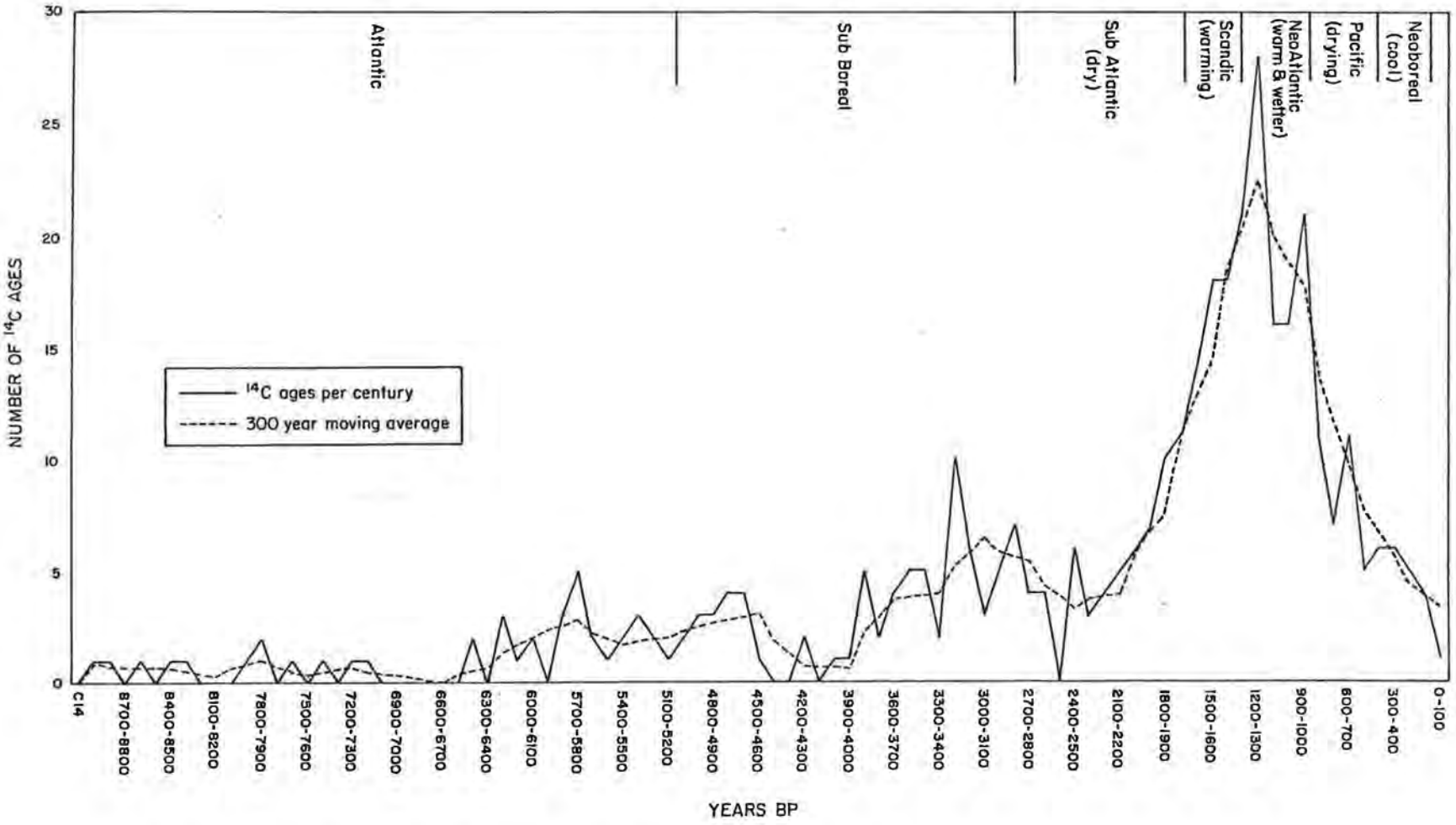

Figure 1-2. Radiocarbon dates from the Platte River Basin.

Paleoindian Stage

This stage refers to the time when the inhabitants of the Platte River Basin subsisted in large part on now-extinct megafauna, including mammoth and bison. The Paleoindian is divided into four periods: the Clovis, Goshen, Folsom, and Plano periods. Mark Chenault describes the Paleoindian occupation of the region in Chapter 4.

Archaic Stage

The Archaic period followed the big-game hunting of the Paleoindian period, with a subsistence system based on the collecting of plant resources and the hunting of small game. Numerous grinding stones have been found at Archaic sites, attesting to an increased reliance on plant foods. As mentioned above, archaeologists in the region have divided the Archaic period into Early, Middle, and Late periods. The Archaic period in the Platte River Drainage is described in Chapter 5 of this report by Marcia Tate.

Late Prehistoric Stage

As Eighmy (1984) stated, there are two major periods in the Late Prehistoric stage in the Platte River Basin: the Early Ceramic and the Middle Ceramic. Hallmarks of the Early Ceramic period are the presence of cordmarked pottery and small corner-notched projectile points. Smoothed cord-marked pottery that appears similar to the Upper Republican pottery in Kansas and Nebraska is found in the Middle Ceramic period contexts, along with triangular projectile points (Eighmy 1984). The Early and Middle Ceramic are described by Kevin Gilmore in Chapter 6 of this volume.

Protohistoric Stage

The final stage of the prehistory of the Platte River Basin is the Protohistoric. This represents the period following the Middle Ceramic up until the time Europeans entered the region. For this report, we use the year when Coronado arrived (A.D. 1540) as the point when the Protohistoric begins. Bonnie Clark provides a discussion of the Platte River Basin Protohistoric period in Chapter 7.

Chapter 2

ENVIRONMENT

Marcia J. Tate and Kevin P. Gilmore

Discussions follow for the individual components of the modern environment, as well as a general summary of paleoenvironmental conditions throughout the prehistoric era. The former include descriptions of the physiography, climate, geology, soils, flora and fauna of the plains and mountainous regions of Colorado that are part of the drainage basins of the Platte and Kansas rivers, the latter of which is found in eastern Kansas.

PHYSIOGRAPHY

The Platte River basin in Colorado drains parts of two physiographic provinces: the Great Plains and the Southern Rocky Mountains. The area of Colorado that lies in the High Plains of the Great Plains province, between the South Platte and Arkansas rivers adjacent to the state's eastern border, is drained by streams of the Kansas River basin. The two physiographic provinces and the transition zone of hogbacks/foothills that divides them are briefly described below.

Great Plains Province

The Great Plains is a broad belt of highland resembling a plateau, that extends from Canada to the Pecos River and Rio Grande in Texas. It is bounded on the west by the Rocky Mountains and the Wyoming Basin, from which it slopes gently eastward to a discernible rise or scarp, more apparent at its north and south ends as the Missouri Escarpment, or Alamont Moraine, and Balcones Escarpment, respectively. Elevation across the Great Plains ranges from 457 m (1,500 ft) on the east to as much as 1,829 m (6,000 ft) in the west. Structurally, this province is a broad geosynclinal feature that includes a number of basins separated by arches or uplifts. One of the three major basins is the Denver Basin, which covers most of eastern Colorado. Two subregions of the Great Plains are represented in the South Platte and Kansas River basins of eastern Colorado. They are the High Plains, which lie along the east and north edges of the Denver Basin and occupy less than one-half of the total land mass, and the dominant Colorado Piedmont, which occupies the area to the west (Figure 2-1). At the western edge of the Great Plains, separating it from the ranges of the Rocky Mountains is a transition zone of hogbacks and foothills (Fenneman 1931; Thornbury 1965).

The High Plains extend from southern South Dakota almost to the Rio Grande in Texas. This is the area referred to when the entire Great Plains is described as a monotonously flat surface; however, neither the Great Plains nor the High Plains are without some diversity of topography. The High Plains are primarily the remnant of a large fluviatile plain that originally covered an area from the Rocky Mountains eastward beyond its present borders. The dominant feature here is a Tertiary mantle, which is composed of several formations dating from Paleocene to Pliocene times. Particularly abundant in the High Plains are innumerable lesser features–small depressions, relatively common also throughout all of the Great Plains. In the northern portion of

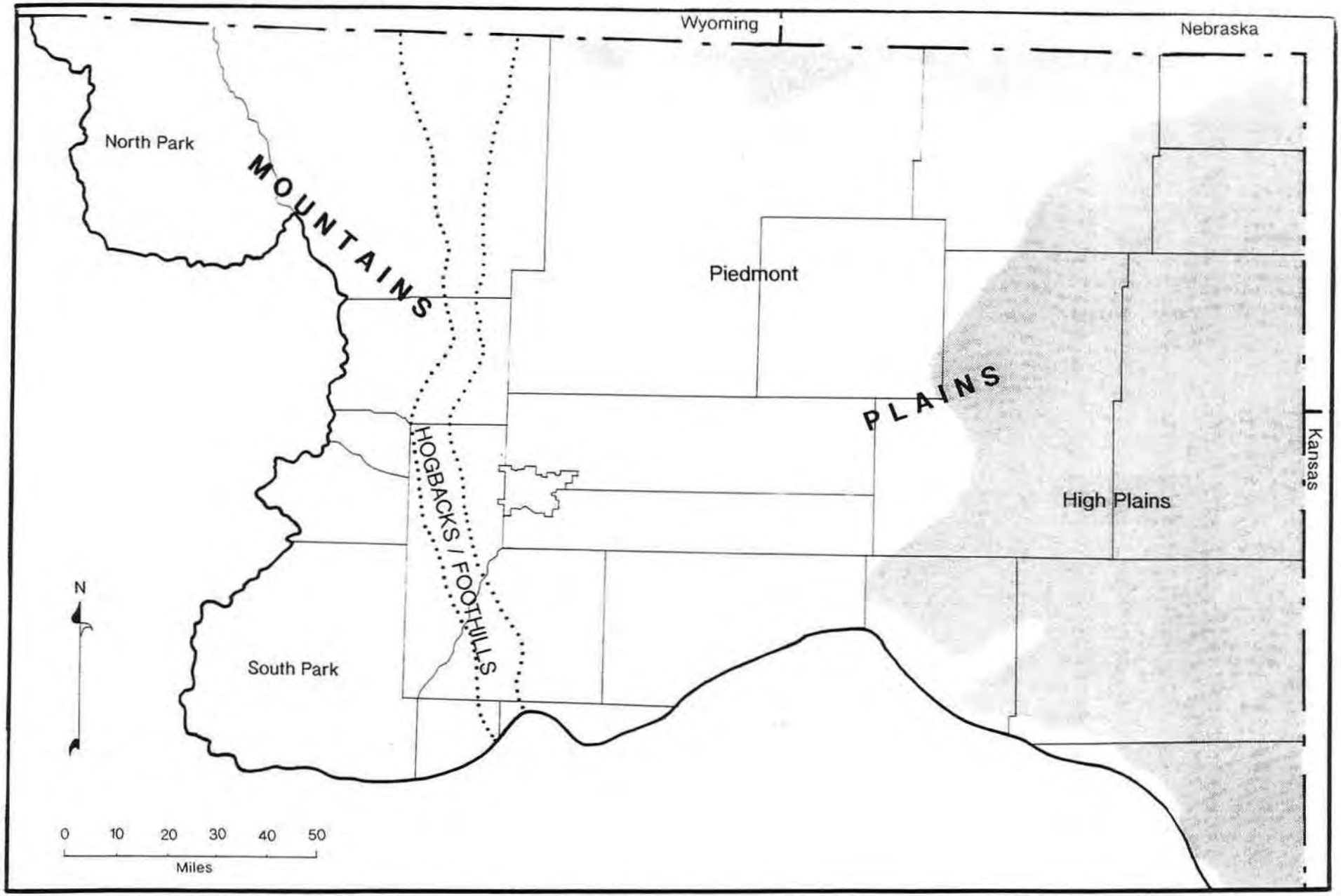

Figure 2-1. Physiography of the Platte River Basin (adapted from Fenneman 1931).

the Platte River drainage basin of Colorado, the High Plains occupy a very narrow strip along the state's northern border, that extends into Nebraska and Wyoming (Thornbury 1965). The dominant portion of the High Plains within Colorado, however, occupies a relatively large area south of the South Platte River, extending eastward into Kansas and Nebraska. This large area is drained by the North and South Republican rivers and various of their tributaries, such as the Arikaree, and by the Smoky Hill River. The Republican and Smoky Hill rivers are part of the greater Kansas River drainage basin. The High Plains are separated from the Colorado Piedmont to the south and west by the edge of the Tertiary mantle, which forms an escarpment (Fenneman 1931).

The Colorado Piedmont is distinguished from the High Plains to the east and north by the lack of its former Tertiary fluviatile mantle, which has been largely stripped away by the action of the South Platte and Arkansas rivers and their numerous tributaries. These rivers have cut valleys several hundred feet below their original levels. To a lesser extent, wind action has also been an agent in this removal. The dominant feature of the Colorado Piedmont is the Denver Basin. The piedmont is bounded on the north by a geologic feature known as the Gangplank and by the Chalk Bluffs, generally along the Wyoming border. The escarpment on the east is a divide area for several east-flowing streams that begin on the High Plains and form the Republican River, which eventually flows into the Kansas River in eastern Kansas. The surface of the Colorado Piedmont descends eastward from elevations of 1,525 to 2,134 m (5,000 to 7,000 ft [the latter on the Palmer Divide between the South Platte and Arkansas river drainage basins])adjacent to the Rockies to 1,219 m (4,000 ft) at its juncture with the High Plains on the east. However, much of the Colorado Piedmont's surface is actually lower than that of the High Plains (Thornbury 1965).

Several tributaries join the South Platte River as it crosses the Colorado Piedmont. From north to south, they include the Cache la Poudre and Big Thompson rivers, St. Vrain, Clear, Bear, Turkey, and Deer creeks, all of which flow from the mountains onto the plains. Farther east, the South Platte's tributaries include Crow Creek on the north, and Bijou, Kiowa, Lost, Box Elder, Sand, Cherry, and Plum creeks on the south and east.

Hogbacks/Foothills Transition Zone

Between the Colorado Piedmont on the east and the Colorado Front Range of the Southern Rocky Mountains is a foothill belt two to four miles wide. This area is characterized by Paleozoic and Mesozoic rocks upon which have developed a series of sedimentary hogback ridges and gravel pediments. Among the hogback ridges are the dominant Dakota sandstone on the east and the dramatic, red Fountain outcroppings on the west.

Southern Rocky Mountain Province

The Rocky Mountains are the major barrier separating the Great Plains from the Colorado Plateau, Great Basin, and Columbia Plateau. The Southern Rocky Mountain province is separated from the Middle Rockies by the Wyoming Basin, a plateau country, on the north. The Southern Rockies are primarily linear features with their main crests located on structural uplifts. Between the belts of mountains lie Colorado's mountain parks, two of which, North and South parks, are within the Platte River drainage basin. Flanking the structural uplifts that form the mountain ranges of the province are outward-dipping strata that form hogback foothills (Fenneman 1931). A

dominant example in eastern Colorado are those adjacent to the Front Range, which form the transitional zone previously discussed.

With the exception of the San Juan Mountains in southwestern Colorado, the Southern Rocky Mountain province is composed primarily of two north/south belts of granite with deep dipping sedimentary formations along their flanks. These are typically foothills, but also cap mountains locally. The easternmost belt, in the area drained by the South Platte River, is dominated by the Colorado Front Range. This mountain chain extends for about 298 km (185 mi) from the Arkansas River almost to the Colorado-Wyoming line, where it bifurcates, creating two ranges, the Laramie Range on the east and the Medicine Bow Mountains on the West. The western granite belt includes the Park Range extending south from Wyoming. South of the point where the Colorado River bisects the belt, the mountains are known as the Gore Range, and the southern extension of this belt is the Mosquito Range. Two spurs, the Kenosha Hills and Tarryall Mountains, split from the main belt at the south end of the Gore Range and trend southeastward. An older generation of mountains forming the Continental Divide surmounts those discussed above. Higher in elevation, their peaks range to more than 4,267 m (14,000 ft). The water for Colorado's main rivers, including both the North Platte and South Platte, originate in these older residual mountains along the Continental Divide (Fenneman 1931; Thornbury 1965).

Between the Front Range on the east and the Park Range on the west are Colorado's mountain parks. These parks are typically extensive basins, broad depressions with characteristically few or no trees. North and Middle parks together form an elliptical area of Cretaceous and Tertiary strata in a synclinal basin. The basin is surrounded by the crystalline rocks of the two mountain ranges. On the north, the ellipse ends near the Wyoming border, where the cores of the Park Range and Medicine Bow Mountains merge. On the south, the basin extends to the point where the Park Range and Front Range join. Though the two parks are structurally a single basin 161 km (100 mi) long and as much as 64-80 km (40-50 m) wide, they are separated by a subordinate east/west anticline, which is covered by volcanic rock. This ridge, the Rabbit Ears Range, is 610-1,219 m (2,000-4,000 ft) high. Middle Park, however, is drained by the Colorado River, but North Park is drained by the North Platte. North Park itself covers almost 2,600 km^2 (1,000 mi^2). At a mean elevation of 2,469 m (8,100 ft), its floor is bordered by hogback hills. Except for the stream valleys, the topography on the floor of the park is generally low and mildly rolling. Around the edges of the basin, the park floor is broken by several ridges and low mountains. One of the major ridges, known as Owl or Peterson ridge bisects the park in a southeast/northwest direction, effectively dividing the park into north/south segments. North Park and the adjacent mountains form the watershed for the North Platte River. Major tributaries of the river in the area include Grizzly Creek, Roaring Fork, and North Fork on the west side of the park and the Canadian River and, Michigan and Illinois creeks on the east side. The park's major streams have cut valleys about 61 m (200 ft) deep on the floor of the park. Flowing northward, the North Platte River leaves the park via a canyon cut through the granite barrier that forms North Park's border (Fenneman 1931; Fletcher 1981).

South Park, a faulted syncline lying between the Front Range and the Sawatch Uplift, is a large structural basin 72 km (45 mi) long by as much as 56 km (35 mi) wide, covering about 3,640 km^2 (1,400 mi^2). Elevation within the basin ranges from 2,592 to 3,048 m (8,500 to 10,000 ft). Bounded by the Mosquito (Park) Range on the west and the Continental Divide, Kenosha Hills, and Tarryall Mountains on the north, the south and east edges of the park manifest no continuous rim or boundaries. The park is characterized by moderately sloping terrain, a result of the

prevalent ridge and drainage topography. A dominant feature of the park is Red Hill, a long hogback of sedimentary rocks, similar to the Dakota Hogback near Denver, which trends south and southwestward, bisecting South Park. Eighty percent of the area is drained by the South Platte River, which originates in high mountains northwest of the park and leaves the area via Eleven Mile Canyon through the Front Range and onto the plains to the east. The South Platte's major tributaries within the park are Middle Fork, South Fork, Fourmile Creek, and Trout Creek. Park and Michigan creeks join Tarryall Creek in the north part of the park; Tarryall Creek joins the south Platte in Eleven Mile Canyon within the Front Range. The extreme southern portion of the park is drained by the Arkansas River (Thornbury 1965; Fenneman 1931; Chronic 1980).

CLIMATE

Colorado has a continental-type climate, characterized by great diurnal and annual temperature variation. Using Wladimir Koppen's classification system, first presented in 1918 and somewhat modified since then (see Trewartha 1968), the climate of the High Plains and Colorado Piedmont areas can be further described as middle-latitude cool steppe, and the Rocky Mountains have a cool, snow-forest climate. Regionally, the climate is one of the most varied on the North American continent. For example, there are marked differences between the climates of the Front Range and those of the Colorado Piedmont and North or South parks.

The Front Range of the Colorado Rockies has been described as both a climatological island surrounded by warmer, drier lands, but also as a dominant modifier of the regional climate. Four factors are responsible for the effect of the mountains on surrounding climate: first, topographic relief exceeds 2,896 m (9,500 ft), and with increases in elevation, air is cooled; second, as temperatures in an air mass fall, the humidity rises until the air is saturated and precipitation is increased, so that precipitation in the mountains is markedly more than on the Colorado Piedmont; third, differences in exposure often produce dramatic climatic variation, for example, microclimates, as seen in vegetation patterns on north- and south-facing slopes; fourth, the combination of altitude and exposure affects precipitation patterns. Increased precipitation falls to the windward side of mountain masses, although precipitation shadows lie to the leeward side (Hansen et al. 1978).

As a barrier to the free flow of air masses, the Front Range inhibits or alters the movement of air by deflecting it upward, downward, and sidewards. In winter, polar air masses spreading southward are frequently pushed against the east slopes of the range, resulting in temperatures that are sometimes greatly colder on the plains than at higher elevations nearby. Low pressure areas form in the Oklahoma/Texas panhandles along a stationary front and result in upslope flow of arctic air, bringing precipitation to eastern Colorado, while western Colorado enjoys fair weather. Also in winter, the mountain range alters the flow of Pacific air blowing in from the west. This often results in heavy snowfall in the mountains while the plains experience dry air and sunny skies. In spring and fall, the mountains block the northwestward flow of humid Gulf air from the southeast, and heavy showers on the Colorado Piedmont and the eastern slope often result (Hansen et al. 1978).

The Palmer Divide, a wide cool highland with an altitude about 610 m (2,000 ft) higher than the Colorado Piedmont, separates the South Platte and Arkansas drainage basins. This

east/west landform also acts as a barrier to the movement of air masses, although to a lesser extent than the mountains, and modifies weather patterns on the plains (Hansen et al. 1978).

The High Plains and Colorado Piedmont experience relatively hot daytime temperatures in summer. These are frequently relieved by afternoon thunderstorms, often accompanied by hail. Night temperatures are generally cool. In winter, there are alternating periods of severe cold resulting from arctic air from the north and northwest, and mild weather, a result of winds from the west being warmed as they move downslope. When snows are accompanied by heavy winds, blizzard conditions result (Crabb 1980). Average January temperatures range from 26-29°F at various points on the High Plains; average July temperatures in the area range from about 71-76°F. In the Colorado Piedmont, average January temperatures range from 24°F along the South Platte River in the northeastern part of the state to 33°F at the edge of the mountains. Average July temperatures range from 70°F in the relatively higher elevation of the Palmer Divide area to 74°F near the foothills. Annual precipitation, most of which falls in spring and summer, ranges from 33 to 43 cm (13-17 inches) in the High Plains and 30 to 46 cm (12-18 inches) in the Colorado Piedmont (National Climatic Data Center [NCDC]1982; 1984).

A favorable microclimate is found in the hogbacks/foothills area. A slipper-shaped pocket of warmer air is found nestling against the foothills and extending eastward onto the Plains of the South Platte River near Denver. This results from the protection of both the Front Range to the west, which obstructs advancing cold air and provides for warming, downslope winds, and the Palmer Divide to the south, which deflects many southern advances. This warm air, which is found at low elevation, follows the South Platte from the mountains north and east as the valley provides drainage for heavy, colder air, preventing its entrapment. Characteristic of this microenvironment are relatively warmer temperatures year-round, especially in winter, and a smaller diurnal temperature variation. The warmer average winter temperature noted above is an example of this manifestation (Tate 1997).

In the Front Range summers are relatively short and cool. As elevation increases both cooler temperatures and more humid conditions prevail. Thunderstorms or rain showers, sometimes accompanied by hail, occur almost daily. At higher elevations sleet and hail often occur, and occasionally, snow. Snowbanks remain year-round in some areas. Winters are relatively long, compared to the plains, and cold to very cold, depending on elevation. At lower elevations, snow is usually abundant. At higher elevations, blizzard like conditions are common and can be severe; however, the snow often contains little moisture. Significant precipitation occurs both from the west and east (Marr 1967). Average January temperatures range from 14°F on Mount Evans to 27°F at Estes Park. Average July temperatures range from 51°F at Mount Evans to 66°F at Cheesman Reservoir. Annual precipitation, most of which falls from July through October, ranges from 36 cm (14 inches) at Estes Park to almost 135 cm (53 inches) on Mount Evans (NCDC 1982, 1984).

North and South parks form distinct climatic units. As broad valleys, or basins, surrounded by high mountains, the parks are characterized by relatively dry, cool, sunny climates, which in winter can be bitterly cold. Because the parks are enclosed, entrapment, stagnation, stratification, and radiative chilling of cold air results. Nighttime temperatures commonly fall below freezing, even in summer, creating shallow thermal inversions. Great diurnal temperature variation is also characteristic of the parks; a 50° F range is common year-round (Hansen et al. 1978). The parks typically have abundant sunshine and an extremely short frost-free season. In

North Park at Walden, the average January temperature is 16° F and the average for July is 59°F. Annual precipitation in North Park is about 23 cm (9 inches) at Walden. At nearby Clark Peak, the high point in the area, it is 165 cm (65 inches) (Fletcher 1981). In South Park in the Hartsel vicinity, the average temperature for January is 16°F; for July the average is 58°F. Average annual precipitation in South Park ranges from 25 cm (10.1 inches) at Hartsel, in the center of the valley, to 38 cm (15.2 inches) at Fairplay, towards its western edge (Hansen et al. 1978).

GEOLOGY

The geology of the Great Plains and Southern Rocky Mountain provinces can be discussed in terms of their geomorphic history. This discussion is followed by a description of major structural features.

The rocks of the Great Plains are mainly Mesozoic and Cenozoic in origin. Much of the plains is underlain by rocks of Cretaceous age, however, a veneer of Tertiary rocks is often present. Where this veneer has been removed by erosion, Cretaceous beds form the surface geology. The Tertiary formations range in age from the Paleocene to the Pliocene. The most common of the Tertiary formations are the Fort Union, Wasatch, White River, Chadron, Brule, Arikaree, and Ogallala. Pleistocene deposits of glacial till in the north and silt clay, volcanic ash, dune sand, and fluviatile gravels in other locations are locally important (Thornbury 1965).

The plains have been above sea level since the end of the Cretaceous period. Terrestrial deposits of the earlier Tertiary period are primarily materials removed from the Rocky Mountains, in a series of erosional cycles, dominant of which are those of the Pliocene, which reduced the Rockies to an area of only moderate relief. During this period, the widespread mantle of Ogallala alluvium spread across the plains (Thornbury 1965).

The topographic surface that developed in the mountains at this time is known variously as the Rocky Mountain, Sherman, South Park, or Subsummit peneplain. Following the peneplanation, uplift again occurred. During this and subsequent subcycles, straths developed on major streams in the area. The intermittent erosional and uplifting periods are apparent in pediments and terraces along stream valleys in the Rocky Mountains and plains south of the continental glaciers, including those of Colorado (Thornbury 1965).

The fluviatile covering of the High Plains surface is a remnant of the great mantle that extended from the Rocky Mountains eastward. The uppermost of numerous formations comprising the mantle is the Ogallala. Composed mainly of sandy alluvium extending to depths of a few hundred m in some areas, this formation also includes beds of gravel, silt, clays, and freshwater lime. The Ogallala capstone, which separates the High Plains from the Colorado Piedmont is 3-9 m (10-30 ft) thick, except in Nebraska, where it is not in evidence. Quaternary deposits on the Colorado High Plains represent primarily local accumulations of gravels, sands, clays, silts, and fresh lime in the numerous basins of the plains. Scattered deposits of volcanic ash, loess, Pleistocene terrace gravels, dune sands, sand sheets, and recent alluvium are also found there (Thornbury 1965).

The South Platte and its tributaries have cut deeply, resulting in the removal of the Tertiary fluviatile cover that once mantled the Colorado Piedmont. Wind erosion is a secondary

factor. However, remnants of early Tertiary rocks are still to be found, mainly in the Denver Basin and Palmer Divide area. The major structural feature of the piedmont is the Denver Basin, which is deepest near Denver where down-folding strata of Paleozoic rocks dip steeply before rising gently eastward. Several of these dipping strata produce greatly resistant hogbacks at the eastern edge of the mountains. These include the Pennsylvanian Fountain and Lyons Sandstone hogbacks, and less well known formations, such as Lykins, Ralston Creek, Morrison, Benton Shale, and Niobrara. Most common, however, are the hogbacks of Cretaceous Dakota Sandstone, a distinct landmark for much of the western edge of the piedmont (Thornbury 1965).

Shale underlies much of the Colorado Piedmont. Bedrock formations that outcrop locally include: the Cretaceous Pierre Shale; Fox Hills Formation; Laramie Formation; and the Paleocene Dawson Arkose. In the west, locally interbedded sandstones and limestones create mesas, considered pediplains. Tertiary volcanic rock is also found locally. North and South Table Mountains near Golden are underlain by the Paleocene Arapahoe and Denver formations, which are considered by some geologists to comprise the lower part of the Dawson Arkose, and capped with three basalt flows (Thornbury 1965). Scott (1963) has identified three alluvial capped pediments believed to be of Pleistocene age below the erosional surface of the Front Range. He has further identified several alluviums dating from Pleistocene (Rocky Flats, Verdos, Slocum, Louviers, and Broadway) and Recent (pre-Piney Creek, Piney Creek, and post-Piney Creek) times, following Hunt's (1954) division for alluvial deposits in the Denver area as pre-Wisconsin, Wisconsin, and Recent. Farther downstream on the South Platte are the Kersey, Kuner, and Hardin terraces. The former two are correlatives of the Broadway and Piney Creek terraces, respectively (Holliday 1987).

Fenneman (1931) described the Southern Rockies as mainly a group of linear, anticlinal ranges, with cores of Precambrian igneous or metamorphic rocks. The conventional interpretation of the geologic process at work is that landforms resulted from alternating periods of uplift and peneplanation. The present topography developed since the Laramide Orogeny during the late Mesozoic and early Cenozoic as a series of anticlinal domes on which were superposed numerous lesser faults and folds. The rising mountains brought low temperatures, which resulted in mountain glaciation in the Eocene. Subsequent erosion of the mountains resulted in the development of the Flattop peneplain in the early Tertiary. Uplift of this peneplain was followed by vulcanism. During the Oligocene-Pliocene, erosion and basin-filling in the mountains nearly leveled them, creating the Rocky Mountain peneplain, and mantled the plains in alluvial deposits. Some mountains, however, were not leveled, but remained as large monadnocks. Streams were superposed on the alluvial deposits. Then epeirogenic uplift of hundreds of meters occurred and streams began canyon cutting. The increased altitude of the mountains again resulted in low temperatures and the Pleistocene glaciation was initiated. Minor uplifting in the Pleistocene caused renewed canyon cutting. At this time small parks were created, and a series of alluvial terraces developed in the foothills and plains. Recent erosion began at the end of the Pleistocene (Thornbury 1965).

In recent times, some studies have focused on geoarchaeological analyses of local or regional areas, to map areas of erosion and deposition and determine where the potential for sites of particular periods lies. Of particular note on a local level is the geoarchaeological analysis of South Platte River terraces near Kersey where soil sediment records and radiometric dating were used to develop environmental histories for the Kersey, Kuner, and Hardin terraces and to then evaluate their archaeological potential. The investigators found that Paleoindian sites on the

Kersey terrace are probably not as abundant as some researchers have proposed. They also concluded that although the Kuner strath incision began earlier than 9600 B.P., its greatest potential is for cultural components postdating 7250 B.P. and that the Hardin fill may yield cultural components dating to the Kuner abandonment, ca. 6380 B.P., with this terrace's highest potential for undisturbed cultural components dating from 1900-120 B.P. (McFaul et al. 1994:345-371; see also McFaul et al. 1991).

An earlier study, conducted on a regional level in Kansas, further demonstrates the utility of such studies. Here the investigator studied the differential preservation of Holocene alluvial deposits in the fluvial system to gain a more realistic picture of the pattern of present site distributions. Mandel studied Holocene landscape evolution in two Kansas river basins, the Pawnee of southwestern Kansas and the Lower Smoky Hill of central Kansas. He combined absolute dating with basinwide stratigraphic studies to determine whether deposits of particular periods are differentially preserved in the drainages' networks. From the data collected, Mandel (1992) was able to predict the areas with potential for sites from each cultural period.

The most significant feature of the Quaternary period, which encompasses first the Pleistocene and later the Holocene, is glaciation. While continental glaciation covered much of North America during the Pleistocene, it did not extend into Colorado. However, valley glaciation occurred in many Colorado mountain ranges. The Southern Rocky Mountains experienced at least three distinct episodes of glaciation; the Buffalo, Bull Lake, and Pinedale (Thornbury 1965). All occurred during the Pleistocene epoch. Glaciers formed along the crests of all of the major mountain ranges in the Platte River drainage basin (Chronic and Chronic 1972).

On the east, the Front Range is a group of fault-bounded blocks of Precambrian granite, schists, and gneisses. These are bordered on the west side by a series of overthrust faults from Wyoming to South Park and on the east by a foothill belt 3.2-6.4 km (2-4 mi) wide in which Paleozoic and Mesozoic rocks dip steeply into the Denver Basin. For most of the eastern margin, Paleozoic beds overlie basement complex rocks, but on the west side, the Mesozoic beds rest on Precambrian rocks locally. The edges of the Paleozoic and Mesozoic beds are covered with dipping Tertiary beds (Thornbury 1965).

The Front Range can be described as a complexly folded, anticlinal arch superposed by numerous cross folds and faults; five major fault-bound structural belts have been identified. The primary mass is composed of Precambrian crystalline rocks, which include high-quality metasedimentary, layered metaigneous deposits, and quartzites, intruded by several generations of granitic rocks. The granites include large batholiths forming the north and south ends of the mountain range; on the south is the Pikes Peak Granite, while at the north end is the equally well-known Sherman Granite. In addition to Precambrian rocks, the Tertiary is represented in the Front Range by stocks, sills, dikes, and local extrusives (Thornbury 1965).

At the north end of the Front Range lies the Laramie Range, which is structurally similar to the former, except in the Gangplank area, where the Tertiary formations have not eroded and extend across the Paleozoic and Mesozoic rocks onto Precambrian. However, the Laramies have been reduced to a lower relief than has the axial portion of the Front Range. Tertiary formations on the Gangplank merge with the erosional surface, the Sherman peneplain, that has cut across the Laramie Range. This peneplain, sometimes referred to as a pediment, has an elevation of 2,591 m (8,500 ft) in the west and 2,225 m (7,300 ft) in the east. By the end of the Miocene, the east flank

of the Laramie Mountains was covered with sediments and the Gangplank ramp had started to develop. Tertiary sediments extended onto Precambrian rocks. The erosion of the Sherman Granite and subsequent deposition on the plains continued until the Pleistocene, when uplifting resulted in erosional processes that resulted in the stripping of Tertiary deposits (Thornbury 1965).

The Medicine Bow Mountains, with a central core of Precambrian quartzite, are more rugged than the Laramies. This range, which is at the north end of the Front Range and west of the Laramies, has a high, relatively flat erosional surface at 2,743-3,353 m (9,000-1,000 ft). Above this are the glacially carved Snowy Range peaks, which likely originated in the Pliocene-early Pleistocene period (Thornbury 1965).

Two major ranges comprise the western boundary of the Platte River drainage basin. The Park Range extends southward from Wyoming to the valley of the upper Colorado River and lies west of Colorado's North and Middle parks (also known as the Gore Range in the Middle Park vicinity). West of North Park, the range is alpine, but both north and south of that area its surface is more plateaulike. West of South Park is the Mosquito Range, an eastward-dipping homoclinal arm of a large anticlinal structure, the axis of which follows the crest of the Sawatch Range to the west (Thornbury 1965).

North Park is a broad, flat basin with numerous faults and folds around its margins. The topographic basin was present by the late Miocene as evidenced by the presence of the North Park Formation in late Miocene-early Pliocene times. The park's present topography postdates the North Park formation, which was deposited as a result of volcanic activity. The park was likely filled until its surface was coextensive with the subsumed surface of the Medicine Bows. The present floor of the basin is at an elevation of 2,438 m (8,000 ft), indicating that some 762 m (2,500 ft) have been removed since the Pliocene. The basin fill was adequate to cause superposition of the North Platte across the western flank of the Medicine Bows, where numerous pediments and terraces are now present (Thornbury 1965).

Pre-Quaternary bedrock in North Park includes Precambrian crystalline rocks, Permian and Triassic sediments of the Satanka Shale, Forelle Limestone, and Chugwater Formation. Added to these are Jurassic and Cretaceous sediments of the Sundance, Morrison, and Dakota formations, Benton Shale, Niobrara Formation, and Pierre Shale. Next are Paleocene and Eocene sediments of the Coalmont formation and the Oligocene and Miocene White River and North Park formations, followed by Tertiary intrusives and extrusives. The Pleistocene and Recent epochs are represented by deposits of unconsolidated clay, silt, sand, gravel, cobbles, and boulders that weathered from bedrock and subsequently were transported and deposited. Several areas are covered by windblown sand. In two places, dunes have formed at the base of the Medicine Bows. Colluvial deposits from slope wash, however, are the most widespread surface in the area (Fletcher 1981).

South Park has rocks ranging in time from Precambrian to Pleistocene, although some intervening periods may not be represented. All Tertiary epochs, except possibly the Pliocene, are represented. The Precambrian rocks are metasedimentary and metaigneous gneisses and schists. Sediments younger than Precambrian have been folded in the south-dipping basin, which is broken on the east by a large east-dipping thrust fault known as the Elkhorn. The basin is outlined by the Cretaceous Dakota Sandstone on the north and west, but the sandstone on the east is covered with Precambrian rocks. Red Hill, one of the park's most prominent landmarks, is representative of

Morrison and Dakota formations, as well. Also, older red beds of Paleocene origin, equivalent to the Fountain Formation of the Front Range hogback area, are exposed and include the Permian Maroon formation. The park displays a diversity of topographic features including stream terraces, pediments, lateral and terminal moraines, and outwash plains (Thornbury 1965). Fenneman (1931) called the erosional surface, at elevations of 2,743 and 3,648 m (9,000 and 10,000 ft), the South Park peneplain, which correlates with the Rocky Mountain peneplain.

One result of the geological processes that have shaped the area of the Platte River basin is that in many places cryptocrystalline quartz materials have been left exposed or shallowly buried. Those of relatively high quality have been exploited by prehistoric peoples for tool stone. Such sources include, for example, a distinctive chert obtained from the Flattop quarry near the present town of Sterling in northeastern Colorado; quartzite from the Dakota Formation, which in the area of the South Platte is found at the edge of the Denver Basin; petrified or silicified wood (Parker) from the Dawson Formation, ubiquitous in the southern Denver Basin and Palmer Divide areas; rhyolite from the Castle Rock area; Kremmling chert, Windy Ridge Quartzite, and Table Mountain jasper from various sources in Middle Park; and Trout Creek jasper, known from the Trout Creek Pass area on the southwestern edge of South Park.

SOILS

Five orders of soils have been identified in Colorado's Platte and Kansas drainage basins. They are Alfisols, Aridisols, Entisols, Inceptisols, and Mollisols. These have been further divided by soil suborder, great group, and subgroup (Heil et al. 1977). This soil system is based upon soil properties that are observable and measurable. The properties are selected so that soils of similar genesis and method of origin are grouped. Those properties that differentiate soil orders provide broad climatic groups, with three exceptions: Entisols, Inceptisols, and Histosols, which occur in many different climates (Larsen and Brown 1971) Table 2-1 contains a list of each of the orders and their respective subgroups, 80 in all. This is followed by information about their geographic and topographic locations, origins, physical descriptions, and associated elevations and slope.

FLORA AND FAUNA

In describing the potential natural vegetation of the United States, Kuchler (1964, 1975) mapped 10 vegetation communities within the Platte and Kansas river basins of Colorado. (These are communities that would exist without human interference.) The communities include the dominant Grama-Buffalo Grass, and lesser Sandsage-Bluestem Prairie and Bluestem-Grama Prairie communities found on the High Plains and Colorado Piedmont; the Pine-Douglas-fir community, seen in the hogback-foothills ecotone, the lower slopes of the Front Range, and on the Palmer Divide; the Western Spruce-Fir Forest, and Alpine Meadows and Barren communities of the high mountains, as well as the Douglas-fir Forest community seen in the Medicine Bows; and finally, the Sagebrush Steppe community present in North Park, the Wheatgrass-Needlegrass Shrubsteppe that characterizes the Laramie Basin, and the Wheatgrass-Needlegrass community of South Park. Figure 2-2 employs Kuchler's (1964 and 1975) numerical designators to indicate the geographic distribution and aerial extent of each potential vegetation community. Table 2-2 , which also uses the numbers employed by Kuchler (1964 and 1975) describes the dominant floral species and the respective physiognomy for each community.

Table 2-1. Major Soil Types.

Name	Counties	Soil Origin	Soil Description	Topographic Location	Depth to Bedrock (cm/ inches)	Elevation (m/ft)	Slope (Degrees)
ALFISOLS							
Typic Cryoboralfs	Most extensive soil unit. High, mountainous areas. Continental Divide counties.	Formed from weathered crystalline and sedimentary rocks.	Moderately deep to deep, light colored, well drained soils containing gravels, cobbles, and stones. Rock outcrop.	Mountain slopes, high plateaus, mesas, sparsely vegetated escarpments; interspersed with rock outcrops.	51-152/ 20-60	2,286-3,505/ 7,500-11,500	5-65
Psammentic Eutroboralfs Aridic Haploborolls	Douglas, Elbert, and El Paso	Formed from weathered residual or locally transported material from arkose beds.	Deep, light to dark-colored, well-drained soils with sandy surface layers and loamy subsoils. Loamy.	Gentle slopes to sloping areas of alluvial fans, sideslopes and crests of hills.	152+/ 60+	1,981-2,286/ 6,500-7,500	5-25
ARIDISOLS							
Borollic Haplargids-Typic Cryoborolls	Jackson	Formed from alluvium and outwash and from materials weathered in place from sandstone.	Deep, light-colored, well-drained soils with loamy textures. Loamy.	Benches, high terraces, and low-lying uplands.	152+/ 60+	2,377-2,743/ 7,800-9,000	2-4
Ustollic Haplargids	Larimer and Morgan	Formed in eolian or partly wind-reworked alluvial materials.	Deep, light-colored, well-drained soils with loamy textures. Loamy.	Upland and high terraces.	152+/ 60+	1,218-2,134/ 4,000-7,000	0-5
Ustollic Haplargids-Torriorthents	Arapahoe, Elbert, and Lincoln	Formed in materials weathered residually or locally transported from sandstone, siltstone, and interbedded sandstone and shale.	Shallow to deep light colored, well-drained soils with loamy textures. Loamy.	Uplands broken by outcrops of shale and sandstone, alluvial fans, and shallow drainages with steep side slopes.	152+/ 60+	1,067-1,676/ 3,500-5,500	2-50
Ustollic Haplargids-Paleargids	Lincoln	Formed mostly in fine-textured, calcareous eolian materials.	Deep, light-colored, well-drained soils. Clayey to silty.	Uplands, terraces, and alluvial fans.	152+/ 60+	1,067-1,829/ 3,500-6,000	0-5

Table 2-1. Major Soil Types.

Name	Counties	Soil Origin	Soil Description	Topographic Location	Depth to Bedrock (cm/ inches)	Elevation (m/ft)	Slope (Degrees)
Ustollic Haplargids-Torriorthents	Arapahoe, Adams, Douglas, Elbert, Lincoln , Logan, Morgan, Washington, and Weld	Formed primarily in weathered residual or locally transported materials from shale, sandstone, or interbedded shale and sandstone.	Shallow to moderately deep, light-colored, well-drained soil. Loamy.	Uplands but, may include terraces in sandy areas.	51-152+/ 20-60+	1,219-1,829/ 4,000-6,000	2-50
Ustollic Haplargids-Camborthids	Larimer	Formed primarily in weathered residual material from shale or fine- textured alluvial sediments weathered from shale.	Deep, light-colored, well drained soils with a clayey texture and clayey to loamy subsoils. Clayey.	Uplands, terraces, alluvial fans, and valley side-slopes.	NA	1,524-1,829/ 5,000-6,000	2-15
Ustollic Natrargids-Haplargids	Lincoln	Formed from moderately fine-textured, old outwash sediments which in places contain alkali.	Deep, light-colored, well-drained soils. Loamy to clayey.	Old terraces and uplands.	152+/ 60+	1,372-1,524/ 4,500-5,000	0-
Ustertic Camborthids	Elbert, Kiowa, Lincoln, and Morgan	Formed from weathered residual material from shale and in clay and silty clay alluvium from shale.	Deep, light-colored, well-drained to moderately drained soils. Clayey.	Uplands, terraces and flood plains.	152+/ 60+	1,372-1,829/ 4,500-6,000	0-2
Ustertic Camborthids-Torriorthents	Adams, Arapahoe, Boulder, Cheyenne Elbert, El Paso, Jefferson, Lincoln, Washington, and Weld	Formed in materials weathered in place from shale and in clay and silty alluvium washed from shale uplands.	Shallow, light-colored, well-drained soils. Clayey.	Uplands, slope breaks, fans, and terraces.	51 or less/ 20 or less	1,372-2,134/ 4,500-7,000	0-15
ENTISOLS							
Ustic Torrifluvents-Fluvaquents	Logan and Sedgwick	Formed in mixed alluvial material.	Deep, light colored, well-drained to poorly drained soils. Loamy.	Floodplains and low terraces.	0-91/ 0-36	1,036-1,219/ 3,400-4,000	0-2

Table 2-1. Major Soil Types.

Name	Counties	Soil Origin	Soil Description	Topographic Location	Depth to Bedrock (cm/ inches)	Elevation (m/ft)	Slope (Degrees)
Ustic Torriorthents	Larimer and Weld	Formed in alluvial and eolian material weathered from sandstone and shale.	Deep, light-colored, well-drained soils. Loamy.	Uplands and fans.	152+/ 60+	1,494-1,615/ 4,900-5,300	0-10
Ustic Torriorthents (Brule Materials)	Logan and Weld	Formed in material weathered in place or locally transported from siltstone.	Moderately deep and deep, light-colored, well-drained soils high in silt. Silty loam.	Uplands and fans.	51-152/ 20-60	1,219-1,768/ 4,000-5,800	0-5
Ustic Torriorthents (Loess)	Kit Carson and Yuma	Formed in loess.	Deep, light-colored, well-drained soils that are high in silt. Loess.	Found along the South Fork of the Republican and Arikaree rivers.	152+/ 60+	NA	NA
Lithic Ustic-Torriorthents	Morgan and Weld	Formed in place from sandstone and shale.	Shallow, light-colored, well-drained soils. Loamy.	Low hills, upland breaks, and colluvial slopes. Rock outcrops.	51 or less/ 20 or less	1,067-2,286/ 3,500-7,500	2-50
Ustic Torripsamments	El Paso, Kiowa, Logan, Morgan, Washington, and Yuma	Formed in wind-deposited sands.	Deep, light-colored, excessively well-drained soils. Sandy.	Undulating uplands, hillocks, ridges, and dunes.	152+/ 60+	1,067-1,829/ 3,500-6,000	3-30
Ustic Torripsamments-Haplargids	Cheyenne, Elbert, Lincoln, Morgan, and Weld	Formed in wind-deposited sands and wind worked sandy alluvium.	Deep, light-colored, excessively well-drained soils. Sandy.	Uplands, high terraces, and dunes.	152+/ 60+	1,372-1,676/ 4,500-5,500	2-25
INCEPTISOLS							
Pergelic Cryumberpts-Cryumbrepts-Rock Outcrops	Counties along the Continental Divide	Formed in materials weathered in place or locally transported largely from crystalline rocks.	Shallow to moderately deep, light to dark colored, well-drained soils. Skeletal, loamy.	Alpine slopes and meadows.	51 or less to 102+/ 20 or less to 40+	11,000-14,000/ 3,353-4,267	2-50

Table 2-1. Major Soil Types.

Name	Counties	Soil Origin	Soil Description	Topographic Location	Depth to Bedrock (cm/ inches)	Elevation (m/ft)	Slope (Degrees)
MOLLISOLS							
Typic Cryaquolls-Argic and Cumulic	Jackson and Park	Formed in mixed alluvium.	Deep, dark-colored, cold, poorly drained soil. Loamy.	High mountain meadow areas on flood plains, low terraces and fans.	152+/ 60+	2,377-3,048/ 7,800-10,000	0-5
Aridic Argiborolls-Rock Outcrop	Larimer	Formed in material weathered in place from granite, gneiss, and schist.	Moderately deep to deep, dark-colored soil. Loamy.	Upland hills and mountainsides.	51-152+/ 20-60+	1,829-2,438/ 6,000-8,000	15-50
Aridic Argiborolls-Haploborolls	Douglas and Elbert	Formed in materials weathered in place from shale or sandstone.	Moderately deep to deep dark-colored, well-drained soils. Clayey	Uplands and outwash.	51-152/ 20-60	1,829-1,743/ 6,000-9,000	2-50
Typic Cryoborolls	Jackson	Formed from sandy, gravelly outwash material and wind-deposited sand.	Deep, dark-colored, well drained, cold soils. Sandy loam.	Uplands, outwash plains, and fans.	102-151/ 40-60	2,438-2,591/ 8,000-8,500	0-30
Typic Cryoborolls- Rock Outcrops	Clear Creek, Jackson, Larimer, and Park	Formed in a wide variety of material consisting of glacial till and outwash, weathered sandstone, shale, disintegrated granite, and stony and cobbly coarse-textured alluvium.	Moderately deep and deep, dark-colored, well-drained soil. Loamy.	Mountain sides, mesas, upland benches, old high terraces, and fans.	51-152/ 20-60	1,438-3,048/ 8,000-10,000	2-50
Typic Cryoborolls-Cryothents	Jackson and Larimer	Formed in materials weathered in place from shale or sandstone.	Moderately deep and deep, light colored to dark-colored, well-drained soil. Clayey.	Benches, mountain sides, alluvial fans, old high terraces and valley filled side slopes.	51-152/ 20-60	1,438-3,048/ 8,000-10,000	15-20
Argic Cryoborolls-Cryoborolls	Jackson and Park	Formed in residuum from a variety of crystalline and sedimentary rocks, glacial outwash, and colluvial-alluvial material.	Moderately deep and deep, dark-colored, well-drained soil. Clayey loam.	Benches, mountain sides, high terraces, hills, ridges, fans, till plains, moraines, and valley side slopes.	51-152/ 20-60	1,438-3,353/ 8,000-11,000	2-50

Table 2-1. Major Soil Types.

Name	Counties	Soil Origin	Soil Description	Topographic Location	Depth to Bedrock (cm/ inches)	Elevation (m/ft)	Slope (Degrees)
Argic Cryoborolls-Paleborolls	Jackson	Formed in outwash and alluvium.	Moderately deep and deep, dark-colored, well-drained soil. Loam.	Glacial moraines, high terraces, and fans.	51-152/ 20-60	2,286-2,591/ 7,500-8,500	0-30
Aridic Haploborolls-Haploborolls Argiborolls	Douglas and Larimer	Formed in material weathered in place from sandstone, shale and igneous rocks. Some formed in gravelly, sandy, and cobbly alluvium and glacial outwash.	Moderately deep and deep, dark-colored, well-drained soils. Clayey.	Mountain sides, mesas, and canyons.	51-152/ 20-60	1,829-2,591/ 6,000-8,500	2-45
Lithic Haploborolls-Rock outcrop	Boulder, Douglas, El Paso, and Fremont, Jefferson, and Larimer,	Formed by uplifted sedimentary rocks and colluvial material from these rocks.	Shallow, dark-colored, well drained soils. Loamy.	Mountain sides, foothills and ridges (hogbacks).Formed by uplifted sedimentary rocks.	51 or less/ 20 or less	1,676-2,438/ 5,500-8,000	15-50
Aridic Argiustolls	Boulder and Jefferson	Formed in materials weathered in place from interbedded shale and sandstone.	Deep dark-colored, well-drained soils. Clayey.	High terraces, benches, and alluvial fans	152+/ 60+	1,615-1,981/ 5,300-6,500	1-30
Aridic Argiustolls-Haplargids	Adams, Arapahoe Larimer,, and Weld,			Level to gently sloping upland hills, ridges, and valley side slopes.	152+/ 60+	NA	0-
Aridic Argiustolls-Haplustolls	Arapahoe, Douglas, Elbert, El Paso, and Larimer,	Formed in materials weathered from arkosic sedimentary rock, gravelly alluvium, and residuum from redbed shales and sandstone.	Moderately deep and deep, dark-colored, well-drained soils. Loamy.	Uplands, old terraces, valley side slopes, gravel hills, fans, and upland breaks.	51-152/ 20-60	1,219-2,134/ 4,000-7,000	2-30
Aridic Argiustolls-Torriorthentic Haplustolls	Arapahoe, Elbert, El Paso, and Lincoln	Formed in sandy, windblown material from arkosic sediments.	Moderately deep and deep, dark-colored, well-drained soils. Sandy loam.	Uplands and terraces.	51-152/ 20-60	1,676-2,073/ 5,500-6,800	0-5

Table 2-1. Major Soil Types.

Name	Counties	Soil Origin	Soil Description	Topographic Location	Depth to Bedrock (cm/ inches)	Elevation (m/ft)	Slope (Degrees)
Aridic Argiustolls-Paleustolls	Cheyenne, Elbert, Kiowa, Kit Carson, Lincoln, Logan, Morgan,, Washington, Weld, and Yuma,	Formed in calcareous outwash and alluvium and wind- worked sandy material from old outwash sediments.	Deep, dark-colored, well-drained soils. Clayey loam.	Upland tables and slopes.	152+/ 60+	1,219-1,829/ 4,000-6,000	0-5
Aridic Argiustolls-Ustollic Haplargids	Adams, Arapahoe, Boulder, Douglas, Elbert, Larimer, Logan, Morgan, Washington, and Weld	Formed in fine- and medium-textured material.	Deep, light- to dark-colored, well-drained soils. Clayey loam.	Terraces and fans and sometimes on uplands.	152+/ 60+	1,957-2,134/ 3,500-7,000	0-2
Pachic Argiustolls-Aridic Argiustolls, Torriorthentic Haplustolls	Logan, Washington, and Yuma	Formed in windblown material in old alluvium that has been reworked by wind action.	Deep, dark-colored, well drained soils. Sandy loam.	Uplands, hills, and sand hill valleys.	51-152+/ 20-60+	1,158-1,311/ 3,800-4,300	0-5
Pachic Argiustolls-Aridic Argiustolls	Large narrow, discontinuous body along the eastern state boundary	Formed primarily in loess, often of two ages in wind-reworked, loam-textured old outwash materials.	Deep, dark-colored, well-drained soils. Clayey and silty loam.	Upland plains and tables.	152+/ 60+	1,957-1,372/ 3,500-4,500	2 or less
Torrertic Argiustolls-Ustic Torriorthents	Elbert and El Paso	Formed in calcareous materials weathered from clay shales and non-calcareous material weathered from arkosic sandstone.	Shallow to moderately deep, light-to dark-colored, well-drained soil. Clayey.	Upland plains and ridges with some narrow valleys.	51-127/ 20-50	1,676-1,981/ 5,500-6,500	2-50
Lithic Haplustolls-Aridic Argiustolls Rock Outcrops	Jefferson, Larimer, and Weld	Formed in material weathered from sandstone and shale from alluvium.	Shallow to deep, dark-colored, well-drained soils. Loamy	Ridges, upland plains and high terraces.	51-152/ 20-60	1,676-2,134/ 5,500-7,000	2-50

Table 2-1. Major Soil Types.

Name	Counties	Soil Origin	Soil Description	Topographic Location	Depth to Bedrock (cm/ inches)	Elevation (m/ft)	Slope (Degrees)
Aridic Paleustolls-Ustollic Haplargids	Adams, Boulder, Elbert, Jefferson, Lincoln, and Weld,	Formed in wind-deposited material, old alluvium and materials weathered in place from sedimentary rock, mostly shale.	Moderately deep to deep, light- to dark- colored, well-drained soils. Clayey.	Upland plains, alluvial fans, and old high terraces.	51-152+/ 20-60+	1,524-1,676/ 5,000-5,500	0-15
Aridic Paleustolls-Ustollic Paleargids Ustic Torriorthents	Adams, Arapahoe, Boulder, Cheyenne, Elbert, Kit Carson, Kiowa, Larimer, Lincoln, Morgan, Washington, and Weld	Formed in silty, wind-deposited material.	Deep, light- to dark-colored well-drained soils. Clayey silt.	Upland plains and table lands.	152+/ 60+	1,280-1,585/ 4,200-5,200	0-5
Aridic Paleustolls-Torrertic Argiustolls	Arapahoe, Denver, Douglas, Elbert, and Jefferson	Formed in wind-worked materials from old alluvium or outwash, silty eolian deposits, and in material weathered in place from shale.	Moderately deep to deep, dark colored, well-drained soils. Clayey.	Upland plains and foothills.	51-152+/ 20-60+	1,676-1,981/ 5,500-6,500	0-10

Source: Heil et al. (1977).

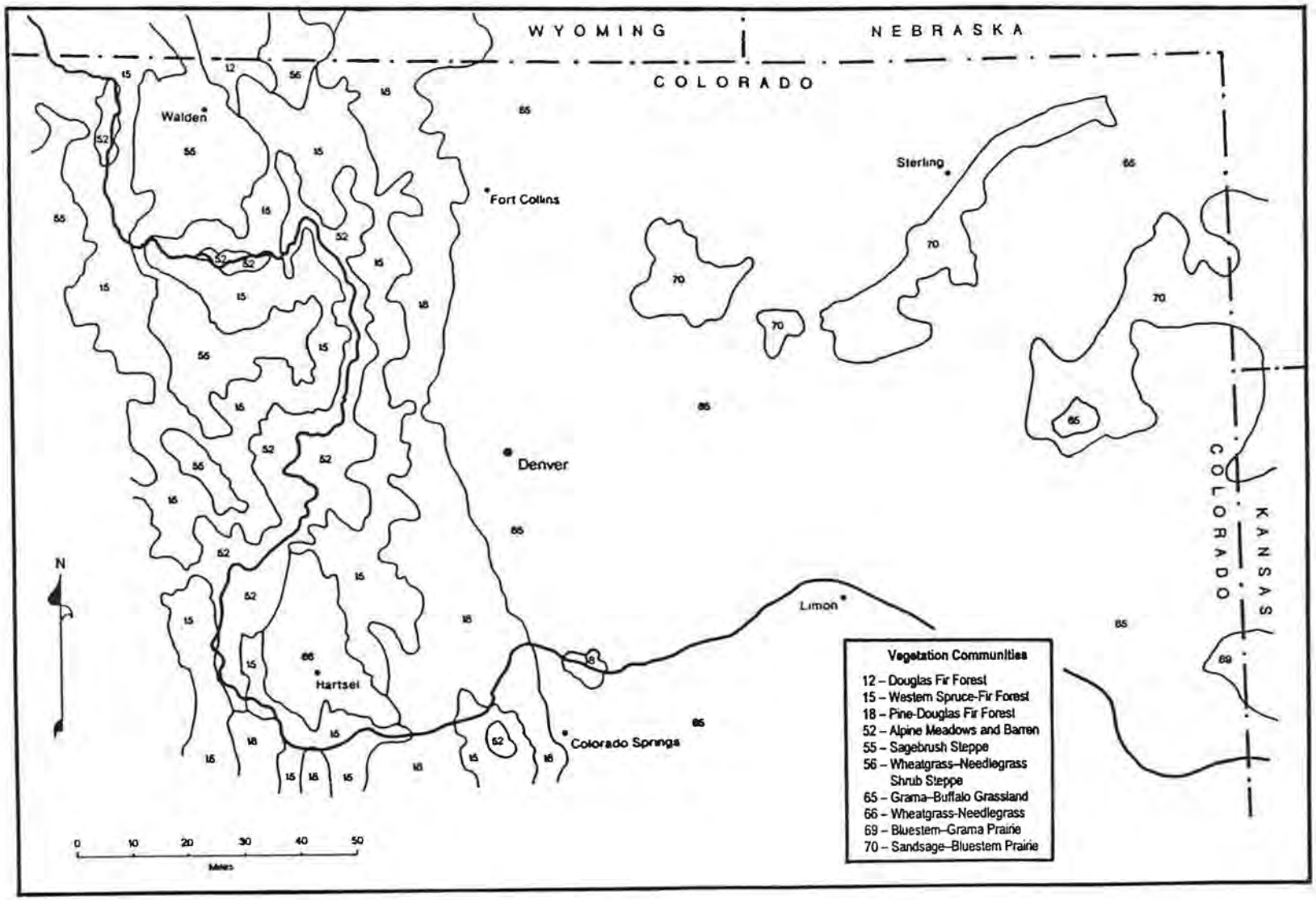

Figure 2-2. Map of Vegetation Zones (adapted from Kuchler 1975).

TABLE 2-2. Vegetation Communities.

Kuchler's (1964, 1975) Map No.*	Area	Kuchler's (1964, 1975) Vegetation Community	Dominant Species	Community Characteristics
65	Plains	Grama-Buffalo Grassland (*Bouteloua-Buchloe*)	Blue Grama (*Bouteloua gracilis*) Buffalo Grass (*Buchloe dactyloides*)	Fairly dense grassland.
70	Plains	Sandsage-Bluestem Prairie (*Artemisia-Andropogon*)	Little Bluestem (*Andropogon scoparius*) Sand Bluestem (*Andropogon hallii*) Sandsage (*Artemisia filifolia*) Hairy Grama (*Bouteloua hirsuta*)	Medium tall, medium dense grassland with many dwarf shrubs.
69	Plains	Bluestem-Grama Prairie (*Andropogon-Bouteloua*)	Little Bluestem (*Andropogon scoparius*) Side-oats Grama (*Bouteloua curtipendula*) Blue Grama (*Bouteloua gracilis*)	Dense, medium tall grassland with many forbs.
18	Hogbacks/ Foothills, Palmer Divide	Pine-Douglas Fir Forest (*Pinus-Pseudotsuga*)	Ponderosa Pine (*Pinus ponderosa*) Douglas Fir (*Pseudotsuga menziesii*)	Open to dense forest of tall evergreens, often with a dense understory.
15	Mountains	Western Spruce-Fir Forest (*Picea-Abies*)	Subalpine Fir (*Abies lasiocarpa*) Engelmann spruce (*Picea engelmannii*)	Dense to open forests of low to medium tall evergreens with a varying understory of shrubs and herbaceous plants.
52	Mountains	Alpine Meadows and Barren (*Agrostis, Carex, Festuca, Poa*)	Bentgrass (*Agrostis* spp.) Sedges (*Carex* spp.) Hair grass (*Deschampsia caespitosa*) Fescue (*Festuca viridula*) Woodrush (*Luzula spicata*) Spike Trisetum (*Trisetum spicatum*)	Short grasses and sedges, dense to very open, there can be large barren area, there are usually many forbs.
12	Mountains	Douglas Fir Forest (*Pseudotsuga*)	Douglas Fir (*Pseudotsuga menziesii*)	Medium dense evergreen forest.
55	North Park	Sagebrush Steppe (*Artemisia-Agropyron*)	Bluebunch wheatgrass *Agropyron spicatum*) Big Sagebrush (*Artemisia tridentata*)	Dense to open grassland with varying densities of shrubs.

Table 2-2. Vegetation Communities.

Kuchler's (1964, 1975) Map No.*	Area	Kuchler's (1964, 1975) Vegetation Community	Dominant Species	Community Characteristics
56	Laramie Basin	Wheatgrass-Needlegrass Shrub Steppe (*Agropyron-Stipa-Artemisia*)	Western Wheatgrass (*Agropyron smithii*) Big Sagebrush (*Artemisia tridentata*) Plains Bluegrass (*Poa arida*) Needle-and-thread Grass (*Stipa comata*)	Open grassland with scattered low shrubs.
66	South Park	Wheatgrass-Needlegrass (*Agropyron-Stipa*)	Western Wheatgrass (*Agropyron smithii*) Blue Grama (*Bouteloua gracilis*) Needle-and-thread Grass (*Stipa comata*) Green Needlegrass (*Stipa viridula*)	Moderately dense, short or medium tall grassland.

* Map numbers are designators used by Kuchler (1964, 1975) to show the distribution of major vegetation communities on maps. The original numbers were used also in Figure 2-2, which shows the distribution of the various vegetation communities.

Table 2-3. Life Zones.

Kuchler's (1964,1975) Vegetation Map No.	Area	Kuchler's (1964; 1975) Vegetation Community	Shelford's (1963) Equivalent Life Zones	Dominant Artiodactyls	Typical Associated Faunal Species
65	Plains	Grama-Buffalo Grassland (*Bouteloua-Buchloe*)	Short-Grass Grassland	Bison (historically) Pronghorn (locally) Mule and White-tailed Deer	White- and Black-Tailed Jack Rabbit, Desert Cottontail Rabbit, Badger, Skunk, Weasel, Coyote, various Foxes, Hawks, Owls, Songbirds, Lesser Prairie Chicken, Western Rattlesnake, Bullsnake
70	Plains	Sandsage-Bluestem Prairie (*Artemisia-Andropogon*)	Short-Grass Grassland	Same as above	Same as above

Table 2-3. Life Zones.

Kuchler's (1964,1975) Vegetation Map No.	Area	Kuchler's (1964; 1975) Vegetation Community	Shelford's (1963) Equivalent Life Zones	Dominant Artiodactyls	Typical Associated Faunal Species
69	Plains	Bluestem-Grama Prairie (*Andropogon-Bouteloua*)	Short-Grass Grassland	Same as above	Same as above
18	Hogbacks/ Foothills; Palmer Divide	Pine-Douglas Fir Forest (*Pinus-Pseudotsuga*)	Lower Montane Forest	Elk and Mule Deer	Porcupine, Striped Skunk, Snowshoe Hare
15	Mountains	Western Spruce-Fir Forest (*Picea-Abies*)	Boreal Coniferous Forest	Moose (historically dominant) and Mule Deer	Black Bear, Grizzly Bear (historically) Wolverine, Porcupine, Great Horned Owl
52	Mountains	Alpine Meadows and Barren (*Agrostis, Carex, Festuca, Poa*)	Elfinwood and Alpine Meadows	Elk, Mule Deer, Big-Horn Sheep	Red Fox, Mice, Pocket Gopher, Marmot, Mountain Lion
12	Mountains	Douglas Fir Forest (*Pseudotsuga*)	Lower Montane Forest	Elk, Mule Deer	Porcupine, Striped Skunk, Snowshoe Hare
55	North Park	Sagebrush Steppe (*Artemisia-Agropyron*)		Elk, Pronghorn, Mule Deer, Bison (historically)	Gray Wolf (historically), Striped Skunk Fox, various rodents
56	Laramie Basin	Wheatgrass-Needlegrass Shrub Steppe (*Agropyron-Stipa-Artemisia*)		Same	Same
66	South Park	Wheatgrass-Needlegrass (*Agropyron-Stipa*)		Elk, Mule Deer, Bison (historically)	Swift Fox, Black-footed Ferret (historically)

References: Vegetation Communities table, Kuchler (1964; 1975); see also Olson et al. (1981).
Lifezones table, Shelford (1963); Bernard and Brown (1977)

Another, not inconsistent, scheme incorporates both flora and fauna into biotic communities which are overlain by life zones (Shelford 1963). The latter are ordered by latitude continentally and by relative elevation in mountainous areas. Marr (1967) has presented a detailed discussion of climax vegetation using more precise elevational criteria, which is confined to the east slope of the Front Range. A third scheme has tied the distribution of mammals, reptiles, and amphibians found in Bureau of Land Management (BLM) physiographic regions to a 1975 version of Kuchler's map (Bernard and Brown 1977). Table 2-3 lists dominant artiodactyls and typically associated fauna for the various life zones. Shelford's (1963) zones, although more comprehensive geographically, also do not include specific descriptions for the vegetation of the various Colorado mountain parks and basins. Relevant life zones described for the Platte River drainage area include Douglas-fir Grassland, Lower and Upper Montane forest, Boreal Coniferous Forest, Elfinwood, and Alpine Meadow.

The Lower Montane Forest is dominated by Douglas and white firs, blue spruce, and ponderosa and limber pine, with an understory of soapberry, blueberry, and glacier lily. The Upper Montane Forest is dominated by Engelmann spruce, subalpine fir, and bristlecone, limber, and lodgepole pines. Principal shrubs include a whortleberry, bearberry, honeysuckle, currant, russet buffaloberry, and willow. Dominant faunal species of this zone are elk and mule deer. Minor influents are porcupines, striped skunk, long-tailed weasel, showshoe hare, and various squirrels, chipmunks, mice, shrews, and voles. Mountain lion is present here, as it is in all of the mountain life zones in Colorado. Numerous species of birds are also represented here, the majority of which occupy both the Lower and Upper zones (Shelford 1963).

In the Colorado mountains, the floral dominants of the Boreal Coniferous Forest are spruce and pine, although aspen is an important influent. The dominant faunal species historically included wolf and moose, mule deer, black and grizzly bears, wolverine, porcupine, and the great horned owl, many of which are still present. Minor influents are rabbit, woodchuck and weasel; and various hawks, woodpeckers, and jays (Shelford 1963).

The Elfinwood is a narrow belt in the Colorado mountains, the distribution of which is largely determined by the amount of snow and wind deposition patterns. The dominant vegetation is Engelmann spruce and subalpine fir, with bristlecone or limber pines the edaphic climax. Whortleberry is an important plant species in this zone. Mammals in the area are mostly visitors of alpine meadows, who shelter in the Elfinwood, especially in winter. These visitors include large mammals, consisting of elk, mule deer, bighorn sheep, bear, coyote, and in historic times, wolf. Smaller mammals, such as the least chipmunk, as well as several mice and voles shelter here. Birds in the Elfinwood include the brown creeper and pine grosbeak (Shelford 1963).

The Alpine Meadows zone is found both at high elevations and in woodlands of lower elevations. This zone is typified by low succulent herbs and taller grasses on peaks and spurs. Sedges and grasses are the dominant vegetation. The latter include bluegrasses, clover, wheatgrass, fescue, and other species. Visitors include sheep and elk, coyote, red fox, various mice, pocket gopher, and an occasional snow rabbit and mountain lion. Marmots are regular residents (Shelford 1963).

PALEOENVIRONMENT

The climatic models of Bryson et al. (1970), Wendland and Bryson (1974), an updated version of the latter model using an expanded data set of radiocarbon ages (Wendland 1995), and the model of Holocene paleoclimate based on vegetation and archaeological sites (Wendland 1978) have been adapted extensively by archaeologists as a baseline for interpretation of both local and regional paleoenvironments (e.g. Brunswig 1996; Butler 1986; Greiser 1985). Contrary to the opinions of some (Benedict 1981; Gilmore 1991b), this baseline has proven to be of sufficient utility to be used here as a point of departure for a summary and discussion of the regional and local paleoenvironments of the Platte River Basin. The updated version of the Bryson and Wendland (1974) climatic model presented by Wendland (1995) yielded similar results. The modes of radiocarbon ages thought to represent large-scale changes in climate show a high level of agreement between these two studies, although the timing of some of these changes differs between them, as does the number of modes of radiocarbon ages. The transitions between climatic episodes outlined by Bryson and Wendland (1974) were based on both modes in the occurrence of radiocarbon ages and archaeological evidence of cultural change from around the world, and the climate changes outlined by Wendland (1995) are based on modes in the frequency of radiocarbon ages alone. Where there is some difference between Wendland and Bryson (1974) and Wendland (1995), bracket ages generated by both studies are given.

Wendland's (1978) vegetation and cultural model borrows its structure from the climatic episodes presented by Bryson, et al. (1970) and Wendland and Bryson (1974), which were based on hypothesized persistent patterns of atmospheric circulation and their effect on paleoclimate. All of these studies model paleoclimate on a hemispherical or continental scale, with the assumption that circulation patterns maintained "quasi-steady states" represented by particular climatic episodes, and that transition between these quasi-steady states was comparatively rapid (Bryson et al. 1970:56). Unlike the simpler, three-period climatic model of Antevs (1955) which divided the Holocene into three periods (Anathermal, Altithermal and Medithermal) thought to characterize climatic conditions that were experienced uniformly throughout the west and southwest, the model based on atmospheric circulation is more sophisticated, and allows for differences in regional climate based on the interaction of many factors, such as topography or the interaction of different air masses. Climatic changes in this system are not necessarily simultaneous or in the same direction everywhere. As Wendland (1995:314) explains, "when the general circulation features change (the jet stream, location and intensity of cyclones and anticyclones, etc.), they do so everywhere simultaneously, because the winds are continuous about the hemisphere. Interestingly, the character of the climate does not change in the same manner everywhere. Some locations will warm, while some will simultaneously cool; some will experience increased precipitation, while others will become drier, and yet others exhibit no change at all. For example, when an upper tropospheric ridge of high pressure moves from the Rocky Mountains to the High Plains, the wind direction over eastern Colorado/western Kansas changes from northwesterly to southwesterly, changing cold air advection to that of warmer, more humid air."

An example of how changes in circulation patterns can have different effects in different areas is the change to greater westerly circulation that occurred at about A.D. 1150. In Europe, this dominance of westerly circulation resulted in milder winters and good summers for a greater distance inland, where the same increase in westerlies on the plains resulted in more xeric conditions on the plains east of the Rocky Mountains (Bryson et al. 1970:64). As stated by

Wendland above, this model is useful to interpret general large-scale temporal and spatial patterns of climatic change, but these episodes of change do not necessarily indicate direction; paleoenvironmental change within smaller temporal or spatial units will by necessity rely on data particular to these units, as the circulation model may or may not provide the precise information that enables the determination of smaller scale local or even regional paleoclimatic fluctuations that have an effect on human occupation and site preservation. A good example of small-scale paleocnivironmental fluctuation is the episodic and noncorrelative periods of eolian deposition documented below. Because these models are based on uncalibrated radiocarbon ages, that is the form in which our temporal information is presented unless otherwise stated.

Much of the information used to reconstruct paleoclimate in the mountains of the Platte River Basin is based on the Holocene cirque glacier chronology of Benedict (1973, 1985). Benedict's geochronology is based on a variety of data. Rock weathering, lichenology, pedology, radiocarbon ages from both cultural and noncultural contexts, and horizontal and vertical stratigraphy of various landforms are all sources of information used to define a series of Holocene episodes of cirque glaciation. The interpretation of the extent and length of these episodes has a direct bearing on the paleoenvironment of the mountains.

Paleoindian Stage

Paleoenvironmental data for the Paleoindian stage in northeastern Colorado has been previously summarized in detail in two synthetic articles by Brunswig (1992, 1999b). For more detailed information than is presented below, the reader is directed to these articles.

Late Pleistocene/early Holocene environments between 12,000 and 8000 B.P. can be characterized by a long-term pattern of cyclical warming and decrease in annual precipitation, interspersed by periodic episodes of cooling. This pattern eventually led to a period of warmer and dryer conditions than today (Brunswig 1999b).

Pre-Clovis Period Paleoenvironments (18,000-12,000 B.P.)

The early part of this period is characterized by full glacial conditions, with both continental and mountain glaciers reaching fullest extent between 18,000 and 14,500 B.P. during the late Wisconsin (Pinedale) glacial maximum. The climate was cold and relatively dry compared to modern conditions, with average temperatures depressed between 18° and 27° F and estimated levels of precipitation between 15 and 55 percent of modern values (Leonard 1989; Wells 1983, cited in Brunswig 1992). Multiple lines of evidence suggest that tree line on the Front Range was depressed between 488 and 1829 m (1600 and 6000 ft) relative to the present, with subalpine and alpine vegetation communities reaching the foot of the Front Range (Elias 1986; Elias and Toolin 1990, cited in Brunswig 1992). On the Plains, faunal assemblages and geologic data suggest that conditions were relatively cold and dry, with a cold xeric grassland the dominant vegetation community (Brunswig 1992).

During the later part of the Pre-Clovis period (14,500-11,700 B.P.), full glacial conditions began to ameliorate, resulting in an increase in average temperature compared to the previous period. However, temperatures remain at levels significantly lower than those of the present, with less variation between cool summers and winters that may have exhibited average temperatures close to modern winters. At the Lamb Spring site, mean summer temperatures at 14,500 B.P. were

about nine degrees cooler than at present, and at the Mary Jane ski area, mean summer temperatures had risen to about seven degrees below modern levels by 13,000 B.P. (Elias 1995). Precipitation levels may have been 10-25 percent above present levels, and because of the lower seasonal temperature variation, effective moisture was thought to be even higher than would be explained by just the increase in precipitation. Eastern Colorado is hypothesized to have had a mixed vegetation community of open grasslands and boreal forest, and faunal assemblages show an increase in large animals, including mammoth, over the previous period (Brunswig 1992).

Clovis Period Paleoenvironments (12,000-11,000 B.P.)

During the Clovis period, the environment is characterized by the accelerating deglaciation of continental glaciers. The continuing warming trend results in higher average temperatures than in the previous period, but still approximately 10 degrees below modern levels by 12,000 B.P. and six degrees below modern averages by 11,000 B.P. (Elias 1990, cited in Brunswig 1992). The trend of increasing precipitation also continues, and an increase in effective precipitation may have been the source of the Satanta Peak episode (12,000-10,000 B.P.) of glaciation in the Front Range (Benedict 1985a), and the maintenance of a high water table on the Kersey floodplain (McFaul et al. 1994). Evidence from the plains and the southwest indicates a drought in the late Clovis period (11,300-10,800 B.P.) that may have been severe enough to have resulted in a lowering of water tables with a concomitant reduction in the number of springs, concentrating megafauna to fewer water sources and thereby increasing the efficiency of Clovis hunters and contributing to extinctions (Haynes 1991, cited in Brunswig 1992). In the South Platte River valley, this hypothesized drought may have led to the abandonment of the Kersey terrace and the subsequent cutting of the Kuner terrace (McFaul et al. 1994).

Folsom Period Paleoenvironments (11,000-10,000 B.P.)

The Folsom culture represents an adaptation to environmental changes that occurred at the Pleistocene/Holocene boundary. This period corresponds with the Late Glacial episode, dated prior to 10,050 B.P. (Wendland 1978; Wendland and Bryson 1974) or prior to 9900 B.P. (Wendland 1995). The Laurentide ice sheet had retreated to around the present Canadian border, and in general the warming and drying trends indicated during previous periods continued, although the period began with a return to wetter conditions after the end of the drought in the Clovis period (Haynes 1991, cited in Brunswig 1992). Average summer temperature at the foot of the Front Range is thought to have increased from more than five degrees below the modern average during the early part of the period to near modern levels by the end of the period at around 10,000-9800 B.P. (Elias 1983, 1985; 1995), although pollen records suggest that modern conditions were not reached until almost 1000 years later (Short 1985). An increase in seasonal variation occurred during the Folsom period, with colder winters and warmer summers. Although conditions were wetter than today, they would have been partially offset by the decrease in effective moisture due to increasing seasonal variation in temperature. The presence of Folsom artifacts within eolian sediments at the Powars site is an indicator of dryer conditions during and after occupation (Holliday 1987). Meatal (1995) also documents eolian activity and the deposition of sand sheets at several sites in northeastern Colorado, where well-developed soils with Bt horizons characterize these units. Deposition of this lower unit of sand began prior to 11,000 B.P., and possibly as early as 22,500 B.P. in some areas, based on optical dates on quartz sand grains. Deposition of this lower sand probably ceased by 9000 B.P. Pine-spruce woodlands were shrinking in the foothills and plains as areas of mixed tall grass/short grass prairie expanded

(Brunswig 1992). Fauna from the Lindenmeier site reflect both open grassland and woodland species (Wilmsen and Roberts 1978).

In the mountains, Satanta Peak glaciers (12,000-10,000 B.P.) had begun to retreat by 10,000 B.P. (Benedict 1973, 1985a). Evidence is lacking that Clovis or Folsom people visited the Arapaho Pass area, and in general there is a paucity of Clovis and Folsom artifacts in the Colorado high country, suggesting that early people may have made short forays into the area, but the area above present timberline was not an important part of their economy (Benedict 1985a:76-77).

Plano Period Paleoenvironments (10,000-7500 B.P.)

Continued drying and warming trends during the Plano period resulted in greater areas of prairie grassland, as opposed to the mixed grassland and woodlands of earlier periods (Brunswig 1992). This period corresponds to the Pre-Boreal episode, dating 10,050-9300 B.P. and the Boreal episode, dating 9300-8490 B.P. (Wendland 1978; Wendland and Bryson 1974), and 9900-9200 B.P. and 9200-8200 B.P. respectively, as dated by Wendland (1995). Although there are indications that environmental conditions approached modern levels by the beginning of the period, at the Jones-Miller Hell Gap site on the High Plains near Wray, floral and faunal species were a mix of montane and foothills species with both shortgrass and tallgrass prairie species, which was interpreted as representing somewhat cooler and moister conditions than today (Stanford 1974, 1975, cited in Brunswig 1992). Increasing aridity is suggested by discontinuous eolian deposition on the Kersey terrace between 9600 and 7090 B.P., with cultural material at the Frazier and Jurgens sites being deposited within these sediments (McFaul et al. 1994). Deposition of the late Pleistocene-age lower sand unit near Sterling had ceased by 9000 B.P., and was followed by a period of surface stability and soil development that ended when eolian activity resumed by 7870 B.P. (Madole 1995:166). Increasing aridity and average temperatures in the latter part of the Plano period caused the replacement of mixed tall- and shortgrass prairie ecosystems on the eastern plains with semiarid to arid shortgrass and sagebrush/yucca prairies (Brunswig 1992). The terminal Plano period correlates with the initial Atlantic episode, which begins around 8200 B.P. (Wendland 1995). The Atlantic episode is characterized by increased westerlies which have a drying and warming effect on the plains east of the Rocky Mountains.

During the Satanta Peak/Ptarmigan interval (10,000-7250 B.P.) in the mountains, a period of increased summer warmth and conditions close to modern levels is indicated by a rapid rise in tree line to modern levels by 9200 B.P. Patterned ground on Satanta Peak moraines had become inactive by 8460 B.P. (Benedict 1973). Multiple sources of information indicate temperatures were similar or warmer than modern between 9500 and 7000 B.P. (Brunswig 1999b). Plano groups began to use the high country in much greater numbers than previous Clovis and Folsom groups, with projectile points of various Plano groups outnumbering Clovis and Folsom points 15:1 or 20:1 (Benedict 1985a:77).

Periods of aridity in the mountains are represented by a series of four periods or phases (I-IV) of eolian deposition and sand dune activation documented within several basins in the Rocky Mountains (Ahlbrandt et al. 1983). Xeric conditions during the Plano period are represented by Phase I eolian activity in the Rocky Mountain basins in Colorado and Wyoming, dated between 10,000 and 8000 B.P., with the Cody complex being the earliest of the components associated with active dunes at the Finley site in the Killpecker dune fields of Wyoming. A brief pluvial episode,

or period of increased effective moisture appears to have occurred between Phase I and Phase II (ca. 7500 B.P.) eolian activity (Ahlbrandt et al. 1983:386).

Archaic Stage

The initial part of the Archaic stage is dominated by the Atlantic climatic episode, or what has been called the Altithermal climatic maximum, or Long Drought, defined by Antevs (1955). Antevs' three-part scheme has been used extensively over the last half-century, but as the amount of available, well-dated paleoenvironmental data has increased, it has become increasingly obvious that this climatic episode is much more complex than previously thought, and its effect on human populations varied through time and place. Subsequent to the Atlantic episode, climate and environment began to approach conditions similar to modern levels.

Early Archaic Period Paleoenvironments (7500-5000 B.P.)

The Atlantic episode, dating 8490-5060 B.P. (Bryson and Wendland 1974; Wendland 1978) and 8200-5200 B.P. (Wendland 1995) is a period of strong westerlies (Pacific circulation), resulting in lower precipitation and warming on the Great Plains, due to the rain shadow effect of the Rocky Mountains (Wendland 1978:279). A greater persistence in Pacific circulation in eastern Colorado results not only in less precipitation and warming, but the northeast winds associated with Pacific circulation are often stronger and more persistent, resulting in greater mobilization of eolian sand (Borchert 1971:7). Dune forms of Holocene age in northeastern Colorado reflect a northeast paleowind (Ahlbrandt et al. 1983; Madole 1995; Muhs 1985), indicating that major Holocene eolian activity has been associated with persistent Pacific circulation.

The Atlantic episode correlates with the Altithermal, or Long Drought of Antevs (1955), which was characterized as a period of universal aridity throughout the West and Southwest. However, the environment of different regions on the High Plains were not affected equally during the Altithermal; the Atlantic episode was a more complex phenomenon that varied in severity between regions due to differences in topography, surface geology, and ground-water hydrology (Meltzer 1995:351). Benedict (1979a) provides an example of this sort of complexity. He examined the spatial distribution of Altithermal period (7500-5000 B.P.) radiocarbon ages throughout western North America, using these data as an estimate of population densities and distributions during this period. Based on these data, he determined that in reality the single long drought was actually two periods of drought, 7000-6500 B.P. and 6000-5500 B.P., separated by a period of increased effective moisture. Based on changes in frequencies of dates in dry regions and synchronous and opposite changes in the frequency of dates in regions that would have been cooler and moister, Benedict (1979a:9) proposed that during these droughts people sought refuge in moister, cooler areas such as the Rocky Mountains and the Pacific Northwest. The synchroneity of these changes over a broad area in the middle latitudes of North America suggested to Benedict that changes in the extent and duration of Pacific air masses were the controlling factor. All over northeastern Colorado, extensive eolian deposits and dune formation document the aridity and persistent northwest wind patterns between 7500 and 5000 B.P. (Gilmore 1991b; Madole 1995; McFaul et al. 1994; Muhs 1985). Estimates for the age limits for deposition of the middle unit of eolian sand (8000-1000 B.P.) in northeast Colorado are based mostly on the age estimates for the upper and lower sand (Madole 1995). Radiocarbon ages and optical dating from quartz sand grains of the middle unit of eolian sand suggest that this deposit is the product of multiple eolian

events during middle and late Holocene time, the dates of which are not known (Madole 1995:170). The actual timing of episodes of eolian activity and stability in various areas within a region, and the complexity of the eolian depositional environments and postdepositional processes leading to the preservation of evidence of these events (especially those associated with dunes), suggests that caution should be used when attempting to correlate these events regionally with limited data (Madole 1995).

During the Atlantic episode in the mountains subarea of the Platte River Basin, effective moisture was sufficient to supply the necessary snow to precipitate the growth of cirque glaciers of the Ptarmigan interval, dated from 7250 to 6380 B.P. (Benedict 1981, 1985a). Origin of these glaciers in north-facing snowfields suggests that summer temperatures continued to be warm (Benedict 1981:116); however, there is insufficient information to determine what climatic regime was in effect at the time, or if the Ptarmigan interval correlated with a period of increased effective precipitation farther downslope in the foothills. In the Rocky Mountain basins, a brief pluvial period lasting approximately 500 years separates Phase I and Phase II periods of dune activity, the latter of which is correlated with the initiation of Altithermal conditions at approximately 7500 B.P. Most of the deposition at the Ferris dune fields in Wyoming is thought to have occurred between 7660 and 6460 B.P. A major hiatus in eolian activity of as much as 2500 years between deposition of the Middle and Upper sand is documented for the Killpecker dune fields, with bracket ages of 10,000-7000 B.P. (based on artifact typology) and a radiocarbon age of 5845 B.P. (Ahlbrandt et al. 1983).

Middle Archaic Period Paleoenvironments (5000-3000 B.P.)

The beginning of the Middle Archaic period corresponds to the beginning of the Sub-Boreal episode, dating 5060-2760 B.P. (Wendland 1978; Wendland and Bryson 1974), or 5200-2700 B.P. (Wendland 1995), a period of recovery from Atlantic episode climate. The small amount of information available for the plains results in a mixed picture of conditions during this time. The Western Plains are thought to be getting wetter than modern conditions during the early part of the Sub-Boreal; however, the Northern Plains do not show indications of increasing moisture until 4000 B.P. About this same time, pollen profiles suggest that conditions are dryer in southwest Nebraska (Wendland 1978:280). Discontinuous periods of aridity and associated eolian activity are indicated by deposits of eolian sand dating to between 5120 B.P. and 4420 B.P. (McFaul et al. 1994:371). On the north side of the Palmer Divide at the Bayou Gulch site, eolian deposition had ceased by ca. 5000 B.P., with a subsequent period of increased effective moisture represented by surface stability and soil development that lasted until sometime prior to 3410 B.P. (Gilmore 1991b). This pattern is also apparent in northeastern Colorado; although deposits of eolian sand correlating to the Altithermal or the Atlantic episode have not been positively identified, an episode of soil formation lasting until ca. 3000 B.P. has been identified (Muhs 1985). This period of surface stability and soil formation may correlate to an increase in effective moisture associated with the Triple Lakes advance (5200-3000 B.P.) of Benedict's (1973, 1985a) Front Range cirque glacial sequence. There is no evidence of occupation in the Arapaho Pass area during the Triple Lakes advance; however, two dates from archaeological sites in the Fourth of July Valley that to Triple Lakes time (Benedict 1985a, 1981).

Late Archaic Period Paleoenvironments (3000-1800 B.P.)

The Sub-Atlantic climatic episode, dated 2700-1680 B.P. (Bryson and Wendland 1974; Wendland 1978) and 2700-1500 B.P. (Wendland 1995), which spans almost the entire Late Archaic period and extends into the early part of the Early Ceramic period, is described as a period of "deterioration of climate" (Wendland 1978:281). Summers were wetter and winters were stormier (Wedel 1986:43). Multiple lines of evidence suggest that the Sub-Atlantic episode on the High Plains and Colorado Piedmont of the Platte River Basin was characterized by decreased effective moisture. A period of dune activity and eolian deposition lasting from 3000 B.P. until ca. 1600-1500 B.P. has been documented at several locations on the Great Plains and Colorado Piedmont (Madole 1995; Muhs 1985), and even farther north into the Sand Hills of Nebraska (Ahlbrandt et al. 1983). Similar eolian deposits with associated radiocarbon ages are documented for the Kersey area, dating between 3230 and 2290 B.P. (Jepson et al. 1994). At the Bayou Gulch site, eolian deposition that began prior to 3400 B.P. had ended prior to 1660 B.P. (Gilmore 1991b). Pollen and phytolith records from archaeological sites in the West Stoneham Archaeological District (Brunswig 1996) suggest that after a period of more mesic conditions during the early part of the Late Archaic period (ca. 3350 B.P.), a warming and drying trend resulted in near-modern conditions by 2600 B.P., with the trend continuing for a short time after this date, resulting in warmer and drier conditions than at present. The radiocarbon age curve in Figure 1-2 may reflect population trends in response to environmental conditions during this time. After a steady increase between 4000 and 3000 B.P., the curve reflects a decrease in radiocarbon ages between 3000 and 2400 B.P. in the 300-year moving average curve, after which the number of ages begins to increase.

This Late Archaic period of decreased effective moisture and decrease in radiocarbon ages correlates with Benedict's (1973, 1985a) Triple Lakes/Audubon interval (3000-2400 B.P.). During this interval above tree line, solifluction and sorted net activity slowed or stopped, and soil formation produced oxidation profiles at least as strong as those formed during the Altithermal, indicating warmer and possibly wetter conditions than at present (Benedict 1975:72). The rebound shown in the radiocarbon age curve correlates with the beginning of the Audubon glacial advances (2400-950 B.P.). The Audubon advances are characterized not so much by significant advances in cirque glaciers as they are by repeated brief episodes of expanded general snow cover sufficient to cause significant die off of lichen in the alpine zone of the Front Range. Decreased use of the high country by humans is documented for the crest of the Front Range during periods of lichen die off (Benedict 1999). Recolonization by lichens of areas in which the lichens were killed after these short term events (as little as three to eight years in duration) began at 490 B.C., 35 B.C., A.D. 260, A.D. 685, A.D. 975, and A.D. 1400. All but the last event (A.D. 1400) correlate with the Audubon advances, and are thought to have been the result of an increase in the frequency and severity of upslope snowstorms. The first three of these events are thought to have been the most extensive and severe, based on the percentage of area above tree line affected. The expansion and persistence of snow cover that was sufficient to kill lichen without affecting the mass balance of cirque glaciers suggests one or more episodes of heavy winter precipitation followed by a cool summers. Although Benedict (1999) does not project the effects of these episodes on lower elevations, if they were in fact due to upslope storms they may represent periods of increased precipitation and possibly cooler temperatures at lower elevations in the eastern part of the state. Eolian activity in the Rocky Mountain basins is associated with the Triple Lakes/Audubon interstade, with eolian activity beginning with the formation of the North Park dune fields sometime after 2000 B.P.

Late Prehistoric Stage

The Late Prehistoric stage is characterized by more modern environmental conditions than in earlier periods. The end of the Sub-Atlantic episode lasts until ca. 1680 or 1500 B.P. depending on the model used, is followed in succession by the Scandic, Neo-Atlantic, and Pacific episodes.

Early Ceramic Period Paleoenvironment (1800-800 B.P.)

The initial portion of the Early Ceramic period corresponds to the latter part of the Sub-Atlantic episode, evidenced by eolian activity that continued until ca. 1600-1500 B.P. This and was followed by a period of surface stability and soil development. Pollen and phytolith data specific to the Platte River Basin is relatively scarce for this period. Pollen and phytolith records from archaeological sites in the West Stoneham Archaeological District (Brunswig 1996) suggest that after a short period of warmer and dryer conditions than present, conditions are thought to have moderated by 1920 B.P., with slightly cooler and moister conditions than today. Brunswig (1996:193) characterizes a period of increasing precipitation and conditions possibly slightly warmer than present between 1900 and 1600 B.P., with more effective precipitation than modern conditions between 1700 and 1550. Information is lacking for the period between 1920 and 510 B.P., when conditions were thought to be more mesic than at present.

The Scandic climatic episode, dated 1680-1280 B.P. (Bryson and Wendland 1974; Wendland 1978) and 1500-1200 B.P. (Wendland 1995) is characterized by a warming trend that culminates in the subsequent Neo-Atlantic episode (Wendland 1978:281). According to Brunswig (1996) and Wedel (1986), the Scandic is warmer and probably slightly drier than conditions during the late Sub-Atlantic, but still cooler and moister than present. Evidence from the Platte River Basin would seem to run counter to this pattern. By ca. 1650-1500 B.P., eolian activity in the Platte River Basin has ended, and landforms had stabilized, suggesting increased effective moisture (Gilmore 1991b; Madole 1995; Muhs 1985; McFaul et al. 1995), although in some areas this cessation occurred earlier, ca. 2100 B.P. (Jepson et al. 1994). Pollen data from Bayou Gulch on the north side of the Palmer Divide suggest that vegetation communities represented in the Early Ceramic archaeological strata were not significantly different from modern communities (Short and Stravers 1981). The pollen record from the Crescent site, a rockshelter in the hogbacks/foothills subarea, also suggests that vegetation communities in the vicinity of the site have not changed significantly since occupation of the site, but a slight decrease in oak and pine pollen and a slight increase in sagebrush pollen may indicate slightly warmer and/or drier conditions between 1540 B.P. and 1370 B.P. (Cummings and Moutoux 1997). Corn dating between 1510 B.P. and 1420 B.P. was recovered from Three O'Clock Shelter in the West Stoneham Archaeological District (Brunswig 1996).

After the cessation of eolian activity at ca. 1600-1500 B.P., a well developed soil (A/Bw/C), indicating a relatively substantial period of surface stability developed on what was designated the middle unit of Holocene eolian sand in northeastern Colorado (Madole 1995). Radiocarbon ages of humus from this soil at four separate locations ranged between 1380 B.P. and 940 B.P. One of these locations was the Friehauf site, and cultural material from Late Archaic (recovered from 15 cm above the bottom of the A horizon), Early Ceramic, and Middle Ceramic components was concentrated within the A horizon of this soil, designated Level XI (Dominguez 1986). The position of the diagnostic Late Archaic points toward the bottom of the A horizon suggests that sand was still accumulating when the Late Archaic cultural material was deposited.

Humus from this soil was dated 1380+/-90 B.P., which, when combined with the material culture, suggests that a period of stability of at least 700-800 years separated the cessation of deposition of the middle sand unit and initiation of deposition of the upper unit, which contains Upper Republican cultural material. Studies southeast of Greeley have documented periods of eolian sand deposition dating between 5120 B.P. and 1520 B.P. and a second late episode of deposition that postdates 530 B.P. (McFaul et al. 1995). At the Bayou Gulch site, eolian deposition that began prior to 3400 B.P. had ended sometime before 1660 B.P. and a subsequent period of surface stability and soil formation suggests increased effective moisture from 1660 B.P. until sometime after 1000 B.P. (Gilmore 1991b).

During the Neo-Atlantic climatic episode, dated 1260 B.P. - 850 B.P. (Bryson and Wendland 1974; Wendland 1978), the plains were characterized as somewhat more moist than later in time (Wendland 1978). Brunswig (1996) and Wedel (1986) characterize this episode as continued warmth, with increased moisture, resulting in increased summer precipitation. Pollen records at sites in the East Stoneham Archaeological District suggest a warming and drying trend between 1070 B.P. and 880 B.P., which returns conditions to levels similar to the present by the end of the Early Ceramic period (Brunswig 1996:423-424). Landforms remain stable in many areas until the end of this episode; however, in some areas eolian activity begins sometime after 1000 B.P. (Gilmore 1991b). Eolian activity and vertebrate and invertebrate faunal data suggest that conditions were also drier during the last 1000 years (Holliday 1995).

The Front Range cirque glacial advance that has the most bearing on the period of time represented by the Early Ceramic and Middle Ceramic periods is the last part of the Audubon advances (2400-950 B.P.), discussed in greater detail above in the Late Archaic paleoenvironment section, and the succeeding interval between the Audubon and Arapaho Peak stades, 950-350 B.P. (Benedict 1973, 1985a). The Audubon interval is interesting in that it is characterized as representing periods of expanded snow cover, but these periods were too brief to result in expansion of cirque glaciers, and moraines of Audubon age are few and small on the Front Range (Benedict 1981:118). There is evidence that the Arapaho Pass area was occupied by humans repeatedly during the Audubon, and the timing of these occupations seems to occur after snow has melted and lichen has recolonized the areas in which it was killed. Several of the later episodes of expanded snow cover documented by lichen kill events occurring during the Early and Middle Ceramic period, at A.D. 260, A.D. 685, A.D. 975, and A.D. 1400 (Benedict 1999). Apparently, the general environment above tree line during the Audubon was not persistently poor enough to inhibit occupation of the mountains between periods of expanded snow cover; occupation is in fact characterized as heavy (Benedict 1975, 1985a).

A period of decreased effective moisture is represented in the mountains of the Platte River Basin by the North Park dune fields, which were initially formed during the period designated Phase III in the sequence of Holocene eolian activity in the Rocky Mountain basins (Ahlbrandt et al. 1983). This phase correlates to the Triple Lakes/Audubon interstade (3000-2400 B.P.). The first pulse of Phase III eolian activity occurred between 2000 and 1000 B.P., which is coincident with the latter part of the Audubon advance. A second pulse of eolian activity is dated between 1000 and 500 B.P., and is thought to correlate with the Audubon/Arapaho Peak interstade (Ahlbrandt et al. 1983:387-389).

Middle Ceramic Period Paleoenvironments (800-400 B.P.)

The beginning of the Pacific climatic episode, dated 850-400 B.P. (Bryson and Wendland 1974; Wendland 1978) correlates well with the beginning of the Middle Ceramic period, ca. 800 B.P. The Pacific episode is characterized by increased westerly, or Pacific, air flow, resulting in increasing desiccation east of the Rocky Mountains (Wendland 1978). In the Platte River Basin multiple lines of information indicate xeric conditions during this period. Buried soils with A/C profiles were observed within the upper unit of eolian sand at four locations in northeastern Colorado (Madole 1995). This buried soil was designated Level IX at the Friehauf site (Dominguez 1986). Radiocarbon ages from humus from these buried soils ranged between 1000 B.P. and 810 B.P. This soil is thought to represent a period of surface stability lasting 100 to 300 years, during which the climate was slightly cooler and wetter than at present (Madole 1995:170). Upper Republican cultural material was recovered from the eolian strata between Levels XI and IX, as well as from two more buried A horizons above Level IX (Levels VII and V). These poorly developed soils were interpreted as representing short periods of stability separated by droughts during the Middle Ceramic period (Dominguez 1986:20). Madole (1994) also cites two other deposits of eolian sand northeast of Denver, the first of which is a deposit of eolian sand deposited after 920 B.P. (Forman et al. 1992); the second is at Milton Reservoir, where optical dating of quartz grains taken from a dune estimates age of the dune at 600 - 700 B.P. At the Bayou Gulch site, eolian deposition that began after 1000 B.P. had ended by 510 B.P. (Gilmore 1991b:82). All of these data suggest widespread mobilization of eolian sand occurred in the Platte River Basin east of the mountains after ca. 1000-850 B.P.

In the high country, the Audubon/Arapaho Peak interstade (950-350 B.P.) is characterized as a period that was warm and relatively moist, with vegetation zones in some areas rising almost imperceptibly, and a decrease in patterned ground activity (Benedict 1975:73). A period of expansion of the boundaries of existing snowfields, but not close to the extent of episodes during the Audubon, occurred at A.D. 1400 (Benedict 1999). The second pulse of Phase IV eolian activity in the North Park dune fields is dated to 1000-500 B.P., and is correlated with the Audubon/Arapaho Peak interstade (Ahlbrandt et al. 1983:387-389).

Protohistoric Stage Paleoenvironments (400-100 B.P.)

The Neo-Boreal episode, dated 400-100 B.P. (Bryson and Wendland 1974; Wendland 1978) corresponds with the Protohistoric stage, and is characterized as a period of cooler temperatures (Wendland 1978:281), or cooler and wetter conditions (Wedel 1986:43). At the Bayou Gulch site, eolian deposition had ended by 510 B.P., and a period of surface stability began that lasted until ca. 100 B.P., when effective moisture decreased again, resulting in a thin deposit of eolian sand on the surface (Gilmore 1991b:83-84). In contrast to the late episode of surface stability at Bayou Gulch, eolian sediments are deposited on a paleosol dated 530 B.P. in the Kersey area (McFaul et al. 1995:74). Weakly (1962) documents dendrochronological evidence from Ash Hollow cave in southwestern Nebraska for six episodes of drought between A.D. 1364 and 1692, each lasting more than 15 years (Weakly 1962, cited in Ahlbrandt et al. 1983).

In the mountains, the Neo-Boreal corresponds with the bracket ages for the Arapaho Peak advance (350-100 B.P.), which was characterized as an interval of glacier expansion that was not a result of increased precipitation, but instead was due more likely to the concentration of snow by wind in cirques that were oriented in a way favorable to accumulation (Benedict 1985a:82).

Chapter 3

THEORETICAL AND RESEARCH TOPICS

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The topic of archaeological theory in the Platte River Basin specifically, and in the plains and mountain culture areas in general, is deserving of a volume of its own (e.g., Duke and Wilson 1995a) and is far beyond the scope of this context report. However, the authors attempt herein to provide a brief discussion of the main paradigms in North American archaeology and how they might relate to archaeology on the plains and in the Platte River Basin.

Duke and Wilson (1995b:4) have stated that archaeology on the plains, like much of American archaeology, is dominated by three paradigms: culture history, processualism, and postprocessualism. Falling somewhere between processual and postprocessual theory is Marxist theory, and an aspect of postprocessual theory is found in the topic of gender in prehistory. Each of these models is discussed briefly below. Culture history, however, is still dominant of the paradigms on the plains and remains the one most often used to interpret the archaeological data from the Platte River Basin.

CULTURE-HISTORICAL ARCHAEOLOGY

According to Trigger (1989), the development of culture-historical archaeology was tied to national archaeology, which emphasized the prehistory of a specific people. Culture history often "draws attention to the political and cultural achievements of indigenous ancient civilizations" (Trigger 1989:174). In the New World, archaeologists have tried to reveal the accomplishments and long tenure of indigenous peoples. With the discovery of the first confirmed Paleoindian sites, the presence of native people in North America was pushed backward in time (Willey and Sabloff 1974). These findings were interpreted in the context of the Boasian anthropology of the time (1920s), with the concept of the ethnographic culture and with diffusion as a primary cause of change. Classificatory systems such as that proposed by Gladwin and the Midwest Taxonomic system (McKern 1939) used cultural units (phases, foci, and aspect) as the archaeological equivalent of a tribe or group of related tribes (Trigger 1989:191).

Culture history focuses on archaeological culture rather than on general stages of development. In Europe, there were nationalistic attempts to learn as much as possible about how specific groups had lived. This resulted in attempts at synchronic descriptions of cultures. In the U.S. there was more of an emphasis on scientific objectivity and the production of trait lists. For cultural historians, change in prehistory was attributed to external factors, primarily migration and diffusion (Trigger 1989:206).

Today's culture-historical archaeology has broken free of the reliance on external factors as explanations of change. There is still, however, a focus on trait lists and the description of cultural units. In the Platte Basin, this is largely due to the nature of most of the archaeological work, which is done within the framework of cultural resource management (CRM). Much of the archaeology in the region is "salvage" in nature and is limited in its scope to saving finite archaeological remains in the face of

modern development. This context report is, by its very nature, a culture history. Although other paradigms are discussed to show that plains archaeology is not, and should not be, limited to culture history, it is acknowledge that the focus in this volume is to synthesize the information put forth by others working in the region and to produce a usable culture history for the Platte River Basin.

PROCESSUAL ARCHAEOLOGY

Processual archaeology tries to isolate and study the different processes at work within a society and among societies. There is an emphasis in processual studies on the human-environment relationship, on subsistence, on economy, on social relations and organization, on ideology and its effects on society, and on interactions among societies (Renfrew and Bahn 1991). Processual archaeology follows a cultural evolutionist format with an emphasis on environmental causality and on systems theory, with the latter assuming that equilibrium is the normal state (Kehoe 1995:22-23). There is an emphasis with this paradigm on the use of deductive or logico-deductive reasoning. There has also been in processesual archaeology a desire to arrive at general "laws of cultural dynamics" (Willey and Sabloff 1974:183).

Sometimes referred to as the "New Archaeology," processual archaeology is often associated with Lewis Binford (Trigger 1989). Binford viewed all changes in a society as adaptive responses to changes in the natural environment or in nearby, competing cultural systems. Binford combined the evolutionary and environmentalist thinking of the late culture-historical period with dissatisfaction in the traditional descriptive and chronological goals of American archaeology. He synthesized this with a systems approach and logico-deductive reasoning (Willey and Sabloff 1974:186). "The evolutionary position of most 'new archaeologists' — while not always overtly formulated — assumes the technico-economic realm of culture to be the primarily determinative one in change, with the social and ideational realms changing in secondary relation to it" (Willey and Sabloff 1974:183).

The approach used in processual archaeology is to isolate each system in a society, for example the subsistence system, and study it as a separate variable. The goal is to combine what we have learned about the separate parts or systems into as complete a "reconstruction" of the society as is possible.

New Archaeology and, by extension, processual archaeology has been criticized for its attempt to define "laws" of human behavior. In most cases, this has resulted in laws that are trivial or untrue and are of little value to archaeological interpretation (Flannery 1982). This is not to say, however, that useful processual studies are not being done on the plains (e.g., Bamforth 1988; Greiser 1985; Johnson 1988) or that it is not a useful approach for the archaeology of the Platte River Basin.

MARXIST APPROACHES TO PLAINS ARCHAEOLOGY

Marxism is a varied school of thought that has taken many different forms over the years. Even in American archaeology a great variety of views characterize Marxism. In his volume *A Marxist Archaeology*, Randall McGuire (1992) attempted to draw out a few of the commonalties in Marxist approaches to archaeology and outlined some of the basic attributes shared in the writing of many Marxist archaeologists, including accounting for sociocultural change in terms of social relations between people, and emphasizing contradiction and conflict as vital features of human society and internal sources of change in society.

One of the most common Marxist approaches to archaeology today is known as dialectical Marxism. With an emphasis on human social relations and power, this theoretical framework has been used extensively in both prehistoric and historic archaeology (Saitta and Keen 1990; McGuire and Paynter 1991). Prehistoric archaeologists have recently opened up the distant past to Marxist analysis by critiquing the common and rigid view that class analysis can only be conducted on "state level" societies where clear hierarchical social stratification exists. These archaeologists have argued that even in so-called egalitarian societies, conflicting interest groups exist, and these interest groups are involved in the negotiation of social power.

Richard A. Krause (1995) used such an argument in his analysis of Great Plains mound building. Krause argues that the creation of burial mounds and the interment of goods associated with burials were actively part of the creation and manipulation of social power and authority on the Eastern Plains. As Plains groups became more sedentary, the tradition of gift-giving at time of death became intensified. This practice placed the receiver of the gift in a position of debt. The relations formed by gift-giving could have formed the basis of power and political action first in Archaic and later Woodland groups. Another Plains archaeologist, David Benn (1995), argued that control of labor and surpluses during the development of intensive agriculture on the Eastern Plains resulted in the formation of political authority.

In all Marxist analysis in archaeology, the material world is considered to play an important and active role in the negotiation of power relations (McGuire 1996:101). As opposed to other kinds of studies that interpret material culture as reflecting social difference or hierarchy, dialectical Marxist analysis views material culture as an element in creating and maintaining social groups and power relations. As described above, Krause (1995) sees the existence of burial mounds on the Plains as an active reminder of debt, and in part, the basis of political authority.

POSTPROCESSUAL ARCHAEOLOGY

Postprocessual archaeology derives from several theoretical origins, including postmodernism, and a need for something different from processual archaeology, but is fundamentally based in Marxist and Neo-Marxist thought (Duke and Wilson 1995b:14). This orientation implies a certain political position taken by the postprocessual archaeologist, which may be described as multifaceted. It is important to note some particularly political aspects of postprocessualism, although first it would be prudent to look at how postprocessualism relates to processual (New) archaeology.

Postprocessualists "uniformly reject" the determinant-functionalist role of the environment on cultures employed by traditional processual archaeologists (Duke and Wilson 1995b:7). They do, however, view environmental conditions as independent factors that can, but not always will, drive human action. Postprocessual archaeologists view certain behaviors to be completely unrelated to changes or stability in the environment; further, certain behaviors should not be intellectually linked to the environment, because they cannot be justifiably so linked, or the relationships would require enough conjecture that they lose credibility (Duke 1991:21).

Postprocessualists also reject the positivist search for laws pursued in processual theory; they argue that an objective view of the past can never be reached (Trigger 1989:381). Instead of searching for universalities or laws about the human past that can be broadly applied cross-culturally and diachronologically, postprocessualists attempt, in the tradition of historian Collingwood's (1946) use of hermeneutics, to reach a better *understanding* of the past (Duke and Wilson 1995b:9), in a reflexive

mental exercise moving back and forth between the past and present. Further, postprocessual archaeologists attempt to utilize historical and social contextual analyses of artifacts devoid (as much as possible) of established categories or standards created by Western archaeologists (Duke and Wilson 1995b:10; see Hodder 1987).

Concerning the application of postprocessualist theory in the archaeology of the High Plains in northeastern Colorado, Duke and Wilson (1995b:5-7) point out problems with the processual approach that could be endemic to this area as a whole. They warn archaeologists of an over application of the modern ethnographic record to the prehistoric past, a difficult task in an ethnographically rich area such as the Plains. Further, an anthropological interpretation that could conceivably be facilitated by rich ethnographic sources often overlooks the importance and endurance of material culture. Finally, Duke and Wilson (1995b) urge postprocessual archaeologists to carefully examine archaeological temporal divisions and established culture areas developed by Western scholars in specific archaeological investigations to avoid arbitrary cultural designations of prehistoric cultural resources. This is where a more particularistic, contextual analysis conducted at a local scale to detect localized divergences in meaning, function, and form is preferred by postprocessualists (Hodder 1995:238-239).

It has been argued that Plains cultures have conventionally been thought of as "simple and uninteresting," implying an area of research that has not motivated researchers to attempt new or controversial theoretical explanations (Kehoe 1995:26). Processual assumptions about "simple" societies lead to the belief that these are essentially undifferentiated in nature (Saitta 1992:64). However, it may be that the archaeological record of the Plains region, not the cultures that inhabit it, is what is frequently perceived as simple and uninteresting. A cursory view of postprocessual theory applied to Plains archaeology shows a minimum of examples, and none within the study area. Postprocessual studies of archaeological resources have been conducted in nearby Nebraska (Zimmerman 1995), southeastern Colorado (Weimer 1995), and Kansas (Krause 1995). The lack of this theoretical application in the Platte River Basin may be due to a general scarcity of recent archaeological investigations, and postprocessual analysis might be an interesting addition to the archaeology of the study area.

GENDERED ARCHAEOLOGY ON THE PLAINS

Over the past 15 years, archaeologists have grown increasingly interested in examining gender roles, gender ideologies, and gender systems (Gero and Conkey 1991; Conkey and Spector 1984). Plains archaeologists have been influenced by these theoretical trends and have begun to contribute to an understanding of gender in the past on the Great Plains (Whelan 1991, 1995; Benn 1995; Guenther 1991; O'Brian 1991).

The objectives of a gendered archaeology are generally described as threefold. An engendered archaeology focuses on exposing gender bias in all phases of archaeological inquiry. Archaeologists employing an engendered approach attempt to include men, women, and other gendered people in their understanding of society and identify their participation in social life based on gender relations, gender ideologies, and gender roles. Finally, archaeologists seeking to engender their work attempt to problematize underlying assumptions about gender and difference (Gero and Conkey 1991).

One of the most powerful critiques leveled by archaeologists interested in gender issues is that standard archaeological interpretations tend to project androcentric views into the past (Conkey and Spector 1982:28). Implicit in many models used by archaeologists is a form of biological determinism in

regard to sex-role differentiation. These kinds of frameworks tend to cast women in passive domestic roles and men in active, productive roles.

Many archaeologist have chosen to focus on women as a means of engendering the past because they believe that adding women to narratives about the past is an essential first step in understanding a past that is peopled by both men and women. Until recently, the prehistoric past was understood primarily as a male domain. The presence of "formal" lithic tools in both Paleoindian and Archaic period assemblages, and their uncritical association with male hunting activities, has promoted a vision of the past as a male domain. In her study of lithic assemblages, Joan Gero (1991) has challenged the assumptions that all stone tools were created by men and that the definition of "tools" includes only formally and complexly reduced stone material. Gero argues that utilized flakes, found in the context of the home, were probably used by women in their daily tasks. Further, she argues that there is no reason to believe that women were not also producing some of the more formal flaked bifaces.

Other Plains archaeologists have recently begun to explore how an understanding of gender roles, relations, and ideologies can be important for understanding the archaeological record. Utilizing ethnographic data, Hughes (1991) posited gender-specific activity areas on a Besant site in eastern Montana. Guenther (1991) also utilized ethnographic data to assist in interpretation of features and artifact distributions at the Archaic Horse Creek site. Finally, O'Brian (1991) found similarities in architectural remains found at the Witt site and ethnographic descriptions of Pawnee religious and gender ideologies.

Some of the most promising studies of gender on the plains have examined standard archaeological issues from a gendered perspective. Archaeologists examining changes in technology, innovations in subsistence strategy, and alterations in settlement patterns have begun to examine how changes in these arenas are linked with gender roles and ideologies (Kornfeld and Francis 1991; Duke 1991). These studies have been inspired by more general work in prehistoric archaeology, which seek to understand changes in human societies from a gendered perspective (Brumfeld 1991; Tringham 1991; Hendon 1995). For example, Patty Jo Watson and Mary Kennedy (1991) examined the development of horticulture in the Eastern Woodlands and of the active role of women in encouraging and promoting certain plant species. Christine Hasthorf (1998) has taken the study of domestication processes one step farther by exploring how women and their lineage associations are important instigators in the spread of plants and domestication.

RESEARCH TOPICS

Several research topics are relevant to the prehistory of the Platte Basin. These include settlement patterns, paleodemography, subsistence, trade and exchange, and social organization. Each can be addressed to varying degrees with the existing data from the Platte Basin, and might profit from the gathering and analysis of new data from the region.

Settlement Patterns

One topic of archaeological research that lends itself well to a database such as that of the Platte River Basin is the study of settlement patterns. A settlement pattern is the pattern of sites on a regional landscape. It is compiled through sampling or total survey of an area. Whereas many research topics, for example subsistence, are better studied with data recovered through subsurface testing or excavation,

archaeological survey records are useful for reconstructing settlement patterns, at least at a gross level. When temporally and culturally diagnostic artifacts and/or features are found, survey records can provide information on where habitations and other types of sites were located during specific time periods in prehistory. And, to a certain degree, changes in population size, dispersion, and aggregation can be identified. Each archaeological survey conducted in the Platte Basin can contribute to the overall knowledge of prehistoric settlement in the region. Willey (1953:1) described settlement pattern studies as follows:

> The term "settlement patterns" is defined here as the way in which man disposed himself over the landscape on which he lived. It refers to dwellings, to their arrangement, and to the nature and disposition of other buildings pertaining to community life. These settlements reflect the natural environment, the level of technology on which the builders operated, and various institutions of social interaction and control which the culture maintained. Because settlement patterns are, to a large extent, directly shaped by widely held cultural needs, they offer a strategic starting point for the fundamental interpretation of archaeological cultures.

Before settlement pattern studies became common in archaeology, archaeological study was "segmented," with different researchers each studying specific aspects of a region. Settlement studies, however, have provided a broader, more systemic view of prehistory (Vogt and Leventhal 1983:xx). "Today, settlement archaeology is no longer just the examination of house sites within a settlement, but rather emphasizes a complete or 'holistic' view of the past. Settlement pattern studies are continuing to help form the methodological, and occasionally theoretical, basis for examining an ancient culture as a whole, including its social structure, ideology, iconography, and economy" (Vogt and Leventhal 1983:xiv).

The first step in settlement pattern studies is to map the location of cultural resources across the landscape. This can be accomplished through large-scale survey, or through accrual — such as is the case with the Platte Basin data. The latter, is the situation in a context report, because it is rare for large areas to have been thoroughly surveyed.

Settlement patterns are different from settlement systems. A settlement system consists of the processes that generated the pattern (Flannery 1976:162). Portions of the settlement patterns of the Platte Basin can be derived for broad temporal periods using the database as it now stands. Describing the settlement systems is another matter.

After settlement patterns in a study area are mapped and described, methodological frameworks are needed for comparison and for reconstruction of the settlement system. A number of methods have been used by archaeologists, such as those discussed by Vogt (1983), which includes comparison of culture areas, the direct historical approach and historical analogy, and cross-cultural comparison. Cross-cultural comparison is one of the more useful methods for reconstruction of prehistoric settlement systems. As Willey (1977:86) has stated, even though there is no currently known living pattern in the world that is an analogue for that represented by, for example, an Upper Paleolithic cave site, researches can reconstruct — or construct (Duke and Wilson 1992) — such a lifeway by general knowledge of hunting peoples. Specifically, hunting societies pursue and kill game, make stone tools, and adjust to seasonal rounds in their quest for food. This is interpretation based "on our general knowledge of life itself" (Willey 1977:86). It is primarily this, along with more specific Plains ethnographic analogy, that researches rely on to a great degree in interpreting the archaeological record for the Platte River Basin.

Paleodemography

The subject of this research theme is the prehistoric population of the Platte River Basin, or portions of the basin, for any given temporal period. Of interest is the size and the characteristics of the population in terms of age, sex, and health.

As discussed above in the section on settlement patterns, survey data can provide a look at relative population change through time. This can be done by calculating the number of known sites from a particular temporal period and comparing it to numbers of sites from other periods, or, as is done in this volume, by viewing the number of radiocarbon dates through time as a possible indicator of comparative population size.

Data from excavations can provide an idea of the population of a site at a particular time. This can be combined with data from other excavated sites to again provide an estimate of population numbers for a region or portion of a region. This clearly is limited in accuracy because of the incompleteness of the sample and perhaps because the data have not been compiled in a manner allowing for statistical comparison. Population estimates can be derived from excavated data using ethnographically derived methods such as floor area per person (Naroll 1962; LeBlanc 1971) or number of hearths per family (Chang 1958). Momentary population can be determined through these methods to the degree that contemporaneity can be established.

"Skeletal remains represent another major source of potential evidence of population size and growth" (Ammerman et al. 1976:53). Analysis of human remains can provide information on diet, health, and perhaps patterns of mortality and fertility among prehistoric populations. As reported in this volume, numerous Late Prehistoric burials have been excavated at sites in the Platte River Basin. Unfortunately, no burial populations of sufficient size — certainly not on the level of the prehistoric Hohokam population from the site of Pueblo Grande analyzed by Van Gerven and Sheridan (1994) — to allow characterization of a population for any given time period have been recovered within the Platte River Basin.

Subsistence

Subsistence strategies, denoted by procedures, organizations, activities and technologies, are utilized by cultural groups to procure resources and energy from the environment as a means of survival (Earle 1980:1). This is elementary to archaeologists' understanding of cultural adaptation. Groups obtain resources locally or develop a strategy for the acquiring of needed resources through trade with other groups. The implication is that cultures go through a decision-making process to select which strategy (or combination thereof) will work best according to their biological, cultural, and environmental constraints (Earle 1980:1).

Procurement strategies vary widely and a system that handles the collection, transport and processing of required resources (Earle 1980:2). Generalized strategies may employ the same basic gathering and processing technologies for procurement of many types of food sources, whereas specialized strategies involve a specific set of behaviors used to manage one type of resource. "Procurement costs" would be evaluated by each culture in terms of collection and transport time, the expense of technological materials used in processing, processing time, storage costs (Earle 1980:5-6).

Subsistence activities can be detected in the archaeological record several ways. On the High Plains, a hunting and gathering subsistence strategy prevailed in prehistoric times. Tools such as bows and arrows, atlatls, nets, carrying baskets, butchering devices, digging sticks, and grinding stones are common to hunter-gatherer groups such as those inhabiting the plains area. Features such as hunting blinds, roasting pits, bedrock mortars, and hunting camps are also instrumental to this strategy (Earle 1980:Table 1.1). Additional resources such as stone tools and butchering processing areas are also related to procurement strategies; trade goods from nonlocal sources may reflect a strategy using one group's surplus to procure items from remote sources obtained by another group.

Other categories of artifacts relating to subsistence include remains of habitations and clothing items. These resources may evidence either materials and technologies easily procured by a group and necessary for their type of subsistence strategy, or materials and technologies that are required by a group's culture. Often in the plains region, domestic structures are made of perishable materials (brush, earth, wooden poles, animal skins) and are thus difficult to detect, excepting the "stone circles" commonly interpreted as tipi rings.

Trade and Exchange

Exchange is broadly defined as "the spatial distribution of materials from hand to hand and from social group to social group" (Earle 1982:2). The exchanged materials, either food, technologies or status objects, are deemed necessary for that culture's survival. The exchange of objects goes beyond rudimentary subsistence, however, for these activities require the establishment of certain trade relationships and at times, networks (Earle 1982:2).

In explaining exchange, archaeologists must be able to complete the following tasks: 1) identify the source of the exchanged object, 2) explain the spatial distribution of the exchanged items, and 3) attempt to reconstruct prehistoric relationships facilitating the exchange (Earle 1982:3-4). In the plains region, far-flung trade networks are evidenced by the variety and spatial breadth of the distribution of imported materials. Shell items from the Gulf of Mexico, Dakota Sandstone items, Florence and Burlington chert items (O'Brian 1995:76), as well as iron objects from Michigan have all been identified at plains archaeological sites. Movement of large amounts of nonlocal materials and objects makes sense in an area (the plains) where human populations evidently were fairly mobile and conceivably had intense interactions with multiple groups. In fact, in an area such as this, exchange relationships may have been developed because of a basic need to ensure friendly interactions at times when groups encounter each other. One assumption archaeologists make about trade, communication, and interaction between groups is that the more frequently groups interact with each other on a cooperative level, the more their respective material cultures will resemble one another (Hayden 1993:294). This may explain the many similarities of material culture in Plains groups, implying cooperative social arrangements among various groups.

Trade items that are associated with burials or distinct households in a limited fashion (limited to a select few) may point to social stratification within a group. More often than not, the elite will control movement of status items between and within cultures. Plains groups are traditionally viewed as basically nonstratified societies; however, certain individuals or lineages undoubtedly controlled ownership and movement of certain objects, and probably managed the exchange of these items along with higher ranking members of other Plains groups.

Technology

This research topic is concerned with how the prehistoric inhabitants of the Platte River Basin made and used tools and, further, how they utilized their material culture to provide shelter and subsistence. Because of the mobile way of life of the early inhabitants, and because of the nature of preservation in the region, the only artifacts that remain at most sites in the study area are those of stone and sometimes bone, and, for the later periods, ceramics. The focus here is not only on how particular tools and objects were made but also on how they might have been used and for what purpose.

DISCUSSION

It is necessary initially to construct chronologies and cultural units and even trait lists or their equivalent in any area or region where the prehistory is unknown or sparsely known, not so much as an end in itself, but as a common point of departure on which to base subsequent analysis. In some ways, the entire evolutionary process of the development of North American archaeology must occur in any geographic region before we can begin to understand cultural process, or the role of the individual in prehistory. Strict adherence to any one paradigm is counterproductive in the search for understanding and meaning with regard to the archaeological record, which is at best a vague shadow of the human thought and behavior it represents. This attitude may seem backward and even counterrevolutionary to processualists and postprocessualists alike. Even though he has modified his stance in recent years on the usefulness of aspects of the processual paradigm, Ian Hodder insists in the impossibility of reconciling and incorporating aspects of both perspectives, that

> a hopeless dilemma is created by the dual attempt to maintain a commitment to universal and objective knowledge while at the same time accepting that material culture is contextually influenced by symbolic schemes. The very definition of 'symbol' normally refers to the secondary (abstract, conceptual) and arbitrary nature of signs. Most people would accept that symbolic meanings are constructed within specific historical contexts. It is thus impossible to deal adequately with symbols by retaining an ecologically deterministic view and by maintaining a commitment to objectivism and positivism. Symbols open the floodgates to the contextuality of knowledge claims (1995:237).

To acknowledge the symbolic importance of material culture does not, in our opinion, necessarily negate the functional aspects of objects. As Hodder suggests, the reconciliation of these two perspectives is difficult, and may ultimately prove impossible in some or all circumstances. However, keeping an open mind to a wide range of possible explanations makes sense from a practical standpoint, and CRM is nothing if not practical in its approach, which is limited in all but the rarest circumstances by budgetary constraints. The practical, functional, and ultimately eclectic approach to deriving meaning from the archaeological record should be informed by Freud's take on symbolism as much as Hodder's absolutist stance on the basic incompatibility in the approach toward symbols in the processual and postprocessual models, because sometimes a cigar *is* just a cigar.

Most archaeologists performing day-to-day work are operating within the restrictions dictated by CRM, which by its very nature restricts the goals of the work. Archaeologists operating within this framework are limited by both the nature of CRM and the attitudes gained within the intellectual environment in which they learned their craft, and rarely have the luxury to fit a project to an academic model, versus the most common situation where the project or agency dictates the methods. For the most

part, archaeologists are concerned with the construction of culture-historical models that are informed by the middle range theory of the processual model. Poised on the brink of the millennium, not many archaeologists hold out much hope of the possibility of their being able to generate the overarching "laws" that determined the cultural evolution of human societies and ultimately dictated human behavior that were the lofty goals promised by the empiricism of the New Archaeology more than 30 years ago, especially based on cultural resource inventories of timber cutting units or 68 miles of 30-foot-wide seismic line right-of-way. With this in mind, it makes sense from a practical standpoint to use all of the tools available. A culture-historical framework is enhanced by the knowledge of the techniques and goals based in middle range theory. Researchers need to be cognizant of the possibly symbolic content of objects in various contexts, the possibility of recognizing gender or differential social power in relationships, and how our own biases may color these interpretations. In the end, the goals of archaeology are, no matter what the theoretical orientation, to derive meaning from the archaeological record. In her summary of the postprocessual interpretations of Plains archaeology, Connor states:

> The strength of postprocessualism is that it recognizes that a number of strategies are necessary for a comprehensive interpretation of the past. Under any paradigm, a contribution to the discipline will result from an understanding of the relevant ethnographic and archaeological data, a knowledge of the literature, and a spark of creativity...It is this creativity that will give us new insights into the prehistory of the Great Plains (Connor 1995:234).

The view from the culture history end of the theoretical continuum is remarkably similar. Wedel states goals that are in many ways congruent with those of the postprocessualists:

> ...I have undertaken this study without setting up a specific hypothesis to be tested, since I am not convinced that the interpretations based on such a proposition are necessarily any more valid or scientific or satisfying than those derived from observations not shackled by such preset procedures. The artifacts that provide the data herein I view as cultural fossils, to be analyzed, compared, and interpreted in terms of human activity, not as commodities to be run through a computer from which arcane print-outs can be produced in order to meet a contractual deadline. If the understanding I seek, or clues to it can be found in historical or ethnographic avenues, I welcome that approach as offering a possible solution, not an absolute one...I have chosen herein to pursue what seems to me an appropriately humanistic approach (Wedel 1986:xiv).

The lesson is clear; archaeologists working in the real world can little afford not to use every tool at their disposal. Anyone using an eclectic approach to the study of prehistory may risk being branded as atheoretical by those who cleave rigidly to any one theoretical model. The archaeological record is a nonrenewable resource, and we cannot afford to shortchange it by limiting our interpretations to those permitted by one particular model at the expense of all others.

Chapter 4

PALEOINDIAN STAGE

Mark L. Chenault

INTRODUCTION

Imagine the vast expanses of the Rocky Mountain Front Range and the eastern Colorado plains, void of human inhabitants, lush with grass, and bountiful with game. Cooler and wetter than today, the late Pleistocene and early Holocene environment was populated by a multitude of now-extinct megafauna: mammoth, camels, and sloth lumbered across the grasslands and into the foothills. Into this land ventured the first humans to occupy the Platte River Basin, the Paleoindians. The evidence provided from excavation of Paleoindian sites in the region indicates that they represent a specialized adaptation to late Pleistocene/early Holocene environments built around hunting of those now-extinct species of large game. This interpretation is based on the high proportion of kill sites and game processing sites found in the archaeological record. Tool assemblages associated with Paleoindian components are characterized by large, well-made, flaked stone tools — primarily dart points and specialized hide-processing tools — that generally are technologically distinct from tools made by later groups.

Three periods are commonly recognized within the Paleoindian stage: the Clovis period is characterized by the use of large, fluted lanceolate points and a reliance on hunting mammoth; the Folsom period is characterized by smaller, finely pressure-flaked and fluted lanceolate dart points and a reliance on hunting now-extinct forms of bison; the Plano period includes all of the various cultural complexes that postdate the Folsom period and are characterized by lanceolate and stemmed dart points. A fourth period, the pre-Clovis, was thought at one time to have pre-dated the Clovis period (Eighmy 1984:31), but is now not supported by the evidence.

Most of the knowledge of the Paleoindian stage in the Platte River Basin is the result of the excavation of kill sites and game-processing sites. Less is known about Paleoindian habitation because of the small number of camp sites that have been excavated in Colorado. This situation may be due in part to the differences in visibility between kill and processing sites, which contain a large to moderate amount of faunal bone with associated projectile points, and the comparatively less visible, more ephemeral habitation sites. It is also possible that habitation sites were in locations more often subject to destruction or deep burial by various geomorphological forces (Gilmore et al. 1997).

The following property types are listed in the database from the OAHP for the Paleoindian stage. They consist of open lithic, open camp, open architectural, sheltered architectural, stone quarry, sheltered camp, kill site, burial, and isolated find. In spite of this apparent variety of site types, excavation has revealed that most Paleoindian sites are either camps, animal kill sites, animal processing sites, or a combination of those types. This is not surprising given the mobile hunting way of life envisioned for early humans in the Americas. Thus, sites in the categories of open lithic, open camp, and sheltered camp are probably either long-term or short-term camps

where Paleoindian bands stopped for periods of time in the course of their subsistence rounds. Kill and processing sites are just what the names imply. In such cases, the actual kill site was probably located nearby. Quarry sites were no doubt also visited and utilized by the Paleoindian, and one human burial in the Platte River Basin has been assigned to the Plano period. Isolated finds are artifacts found singly or in small groups and not in direct association with an actual site. To the above site types can be added caches, represented by the Drake Clovis cache described below. Paleoindians may have cached tools, food, and other items to which they could return in the course of their seasonal rounds, thus freeing them from having to carry all of their belongings and supplies with them. Therefore, in reality there were four basic types of site during the Paleoindian stage in the Platte River Basin: campsites, kill/processing sites, burial sites, and caches. The tables retain the categories used in the OAHP database because, as an example, without excavation it may be impossible to distinguish between camps and kill/butchering sites using only surface evidence. The OAHP categories were devised to be descriptive without guessing at site function.

As discussed in Chapter 1, the Platte River Basin is divided into three subareas for the purpose of this context report. The differences in utilization of the three subareas by the Paleoindian can be briefly summarized here. There is little evidence for use of the foothills and mountains by the Clovis or Folsom period peoples. The occasional early projectile points found in the hills and mountains might have been carried there by later people, or at most represent brief forays into the high country by the early Paleoindians. There is, however, evidence that during the Plano period, use of the high country was more widespread, and there appear to have been groups practicing two different types of use of the mountains and foothills during the late Plano period. One system of use appears to have involved seasonal visits by bands that occupied the plains for most of the year. The other type of utilization of the high country involved groups tied more closely to use and occupation of the mountains. The Paleoindian use of the mountains and foothills is discussed in more detail below in the section on the Foothills/Mountain complex.

The discussion that follows is limited to information from sites that have undergone subsurface testing or excavation. Whereas numerous other sites in the database are listed as Paleoindian, they are either isolated finds or are sites that may have a Paleoindian component, based on surface evidence including one or more Paleoindian projectile points or point fragments. These components are often found on sites that have more extensive, later-dating components. Little information on the Paleoindian period can be gleaned from these surface finds. Therefore, they are listed in the tables and shown on distribution maps in the discussions below, but they are not described individually.

CHRONOLOGY

Chronology and temporal placement are always central issues in archaeology. The temporal ranges for the periods within the Paleoindian stage are derived from radiocarbon dates. However, according to Frison (1993:12), "Radiocarbon dates are not accurate within the necessary limits to resolve the chronological relationship problems between the early New World Paleoindian Cultural Complexes." Also, the long plateaus in the calibration curve during the early Holocene suggest that overlaps between sets of dates associated with various projectile points do not necessarily equate with overlapping periods of use of those point types (Douglas Bamforth,

personal communication 1999). Nevertheless, without an alternative, archaeologists must rely on the radiocarbon dates presented by Eighmy and LaBelle (1996).

The pre-Clovis period, which — as discussed below — is a topic of controversy and is generally not accepted, would predate the beginning of the Clovis period at approximately 12,000 B.P. The Clovis period appears to date from 12,000 to 11,000 B.P.; the Folsom period dates from 11,000 to 10,000 B.P.; and the Plano period has a range of 10,000 to 7500 B.P. (Eighmy and LaBelle 1996:64). Table 1 of the Appendix shows radiocarbon dates obtained for Paleoindian sites in the Platte River Basin.

PRE-CLOVIS OCCUPATION

Whether there was a pre-Clovis occupation of the New World has been a topic of archaeological research for some time and has received heightened attention in recent years (Kulisheck 1994). Colorado plays an important role in this inquiry owing to the presence in the Platte River Basin of three sites with purported evidence for something predating Clovis: Selby, Dutton, and Lamb Spring (Figure 4-1). Eighmy (1984) discussed the pre-Clovis occupation of Colorado as though there is conclusive evidence for such an occupation prior to Clovis people. However, as Gleichman and Gleichman (1989:5) said, "A long history of investigations at possible pre-Clovis Sites in North America has failed to locate any undisputed pre-Clovis components." Although the evidence from the Colorado sites is interesting and thought provoking, none of the authors cited (Rancier et al. 1982; Stanford 1979; Stanford et al. 1981) put forth the evidence as unequivocal. And, since it was first suggested, one of the proponents of the pre-Clovis (Stanford) has changed his view and no longer believes in its validity (Peter Gleichman, personal communication 1999). Nor did any of the above authors state that the strata providing pre-Clovis dates in association with possible tools or other evidence (e.g., bone flakes, striations on bone, distributions of bone thought inconsistent with natural taphonomic processes) represented clear evidence of human activity. In fact, more recent in-depth statistical analysis of the Lamb Spring faunal assemblage and comparison of this assemblage to modern ethnographic elephant hunting and butchering practices also proved inconclusive as to whether human activity was represented in the pre-Clovis level (Fisher 1992; Gilmore et al. 1997).

Evidence from Selby, Dutton, and Lamb Spring consisted of the remains of mammoths, horses, camels, bison, and a variety of smaller mammals (Eighmy 1984:33). Diagnostic stone tools were absent from the purported pre-Clovis occupations at the sites. Only one flake from the pre-Clovis level of Lamb Springs had been shaped by human activity (Rancier et al. 1982:13). No stone artifacts could be attributed with any confidence to the pre-Clovis levels at Selby and Dutton (Stanford 1979:113-115). Stanford (1979) originally stated that the evidence for a pre-Clovis occupation in Colorado consisted of the presence of apparent bone expedient tools, of flaked bone, of bone that appeared to have been broken to remove the marrow, and of stone artifacts. Gunnerson (1987:9) examined several of the bone specimens from the sites and was convinced that they were artifacts created by human hands. As he said, carnivores can break and alter bones, but the items from Selby and Dutton evidenced patterned, and thus nonrandom, breakage and polish. Stanford (1983:69), however, admitted that the specimens fall into a "gray" area in which it may not be possible to distinguish natural from human-caused alterations. For the time being, it appears that resolution of the pre-Clovis problem will await "indisputable cultural material

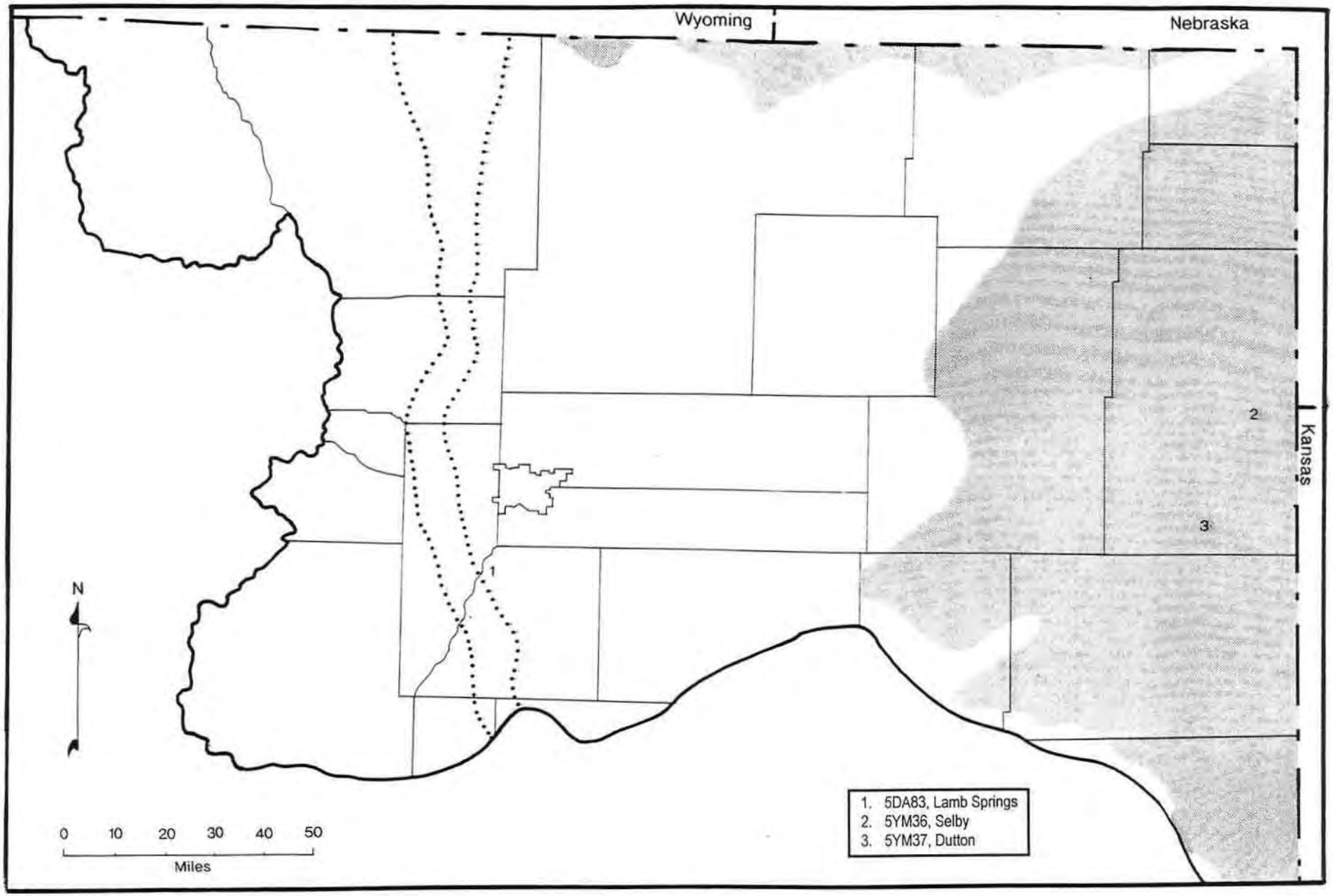

Figure 4-1. Locations of Selby, Dutton, and Lamb Spring sites.

(artifacts or human bones) in an undisturbed primary context, with clearly defined stratigraphy or geological association, with secure and reliable associated absolute dates" (Gleichman and Gleichman 1989:7).

Eighmy (1984) reported dates for Selby and Lamb Springs as being earlier than 10,500 RYBC, and he stated that the pre-Clovis occupation at Dutton could date to 29,000 RYBC. Levels containing faunal bone at both Selby and Dutton were within Peorian Loess, which may date to as old as 29,000 B.P. (Gunnerson 1987:7; Stanford 1979).

Selby Site (5YM36)

The sites of Selby and Dutton were found by construction crews dredging lagoons on farms owned by Lorin Selby and Leonard Dutton near Wray, Colorado, in 1975. Dennis Stanford (1979) and archaeologists from the Smithsonian Institution were working at the Jones-Miller site (see discussion below) at the time and were notified of the finds. Because of the potential for Paleoindian remains, the Smithsonian initiated test excavations at the Selby site. Excavation of the test units revealed remains of mammoth, extinct bison, and horse. According to Stanford (1979:102), geologic correlations with other areas around Wray suggested that the Selby deposits could be more than 15,000 years old. The stratigraphic sequence at both sites consisted of the following from the base up: Peorian Loess, a lacustrine deposit, a late Pleistocene gleysol, and Halocene soil (Stanford 1979:104).

In the lowest levels at Selby, archaeologists found mammoth bones including a complete mandible and two tusks, two complete innominates, one complete scapula, one proximal end of a femur, a complete radius, a few ribs, and several vertebrae. The bones of the feet and ankles, along with the rest of the leg bones, were missing. A pile was found containing the innominates and scapula, with the femur nearby (Stanford 1979:107). Bones of horse, camel, and bison were also discovered. The excavators found two items at first thought to be choppers made from the distal ends of camel metapodials, one in the lacustrine unit and the other in the underlying Peorian Loess. These items displayed edge damage and polish on the proximal end of spiral fractures. Also found was the proximal end of a bison radius with a step-fractured spiral break and polish on the broken end. In addition, there was a split mammoth rib with high polish on one end. Several other bone fragments could have been used as scraping tools (Gunnerson 1987:9; Stanford 1979:110). The current consensus, however, seems to be that the items were not tools, but were instead caused by natural processes. This would, of course, remove Selby's status as an archaeological site.

Dutton Site (5YM37)

Mammoth bones were found only in the lacustrine level at the Dutton site. Foot bones were missing from the remains, but other elements were present. Limb bones and skulls, however, were very fragmentary. According to Stanford (1979:107), whereas skulls take a long time to be buried by natural processes, and therefore often become fragmented, limb bones should have been buried with the rest of the postcranial bones and should not have become so broken.

The excavators at Dutton found four possible choppers made from bison and from horse tibiae. Each of the four, two from bison bone and two from horse, was from the distal ends, with the proximal ends of the spiral fractures ending on the posterior side of the bone. They also found

what appeared to be a large bifacially flaked end scraper of dendritic chert among the camel bones in the Peorian Loess. Also found at Dutton were seven tiny stone flakes, collected during screening of the lacustrine unit. These were very different than the rounded gravel in the deposit, and some had been heat treated. They may have broken away from a chopping tool during use (Stanford 1979:113). It should be noted, however, that these items may have come from the later cultural component at the site.

Excavators found items interpreted as having been flaked from mammoth long bone in the lacustrine units at both Dutton and Selby. Possible cores were found with striking platforms that could have been prepared by repeated crushing blows. Linear striations that may have resulted from the removal of the periosteum were visible on some of the bones. Several of the bone flakes, which were from 4 to 16 cm long, showed possible use-damaged and polished edges. Other flakes showed no wear and were probably debitage (Gunnerson 1987).

Lamb Spring Site (5DA83)

Lamb Spring is a stratified multi component site located around an inactive spring that appears to have been used by humans during the Historic, early Woodland, Archaic, Cody, and perhaps the pre-Clovis periods. The site is located approximately 3.2 km (2 miles) east of the Front Range near Littleton in Douglas County. The site is in a small draw on the divide between the South Platte River and Plum Creek (Stanford et al. 1981). It was discovered in 1960 by Charles Lamb during construction of a stock pond. Lamb notified G. Edward Lewis of the U.S. Geological Survey in Denver, who identified the remains of mammoth, horse, camel, bison, and some smaller species of mammals. Several auger tests were dug at the site by Lewis and Scott. Those test holes revealed pieces of flaked stone among the bones. Because of the potential association between the artifacts and the faunal remains, the Smithsonian Institution was brought in to conduct scientific investigations at the site. During 1961 and 1962, work was conducted at Lamb Springs by Waldo Wedel and C. L. Gazin, and in 1979 to 1981 by Dennis Stanford (Cassells 1997; Stanford et al. 1981).

Scott (1964) identified eight geologic units at the site, the lowest being the Dawson Arkose. The unit above that was a blue-green silty clay from which a bone collagen date of 13,140 ± 1000 B.P. was obtained. The date suggested that the level might be pre-Clovis in age. The excavators found no stone artifacts in the unit, but they did find several mammoth and camel bones that they thought might have been flaked. Such bone modification and the presence of mammoth long bones in piles suggested human activities (Stanford et al. 1981:16; Wedel 1965). A river boulder weighing 15 kg (33 lb) was also found among the bones, and it was believed to have been used perhaps as a bone-processing tool (Stanford et al. 1981).

The excavations in 1980 revealed the remains of at least five mammoths, bringing the total number at the site to more than two dozen. The mammoth remains appeared to represent a normal population curve. No bone tools or stone tools were found with the mammoth bones. Thus, the evidence for pre-Clovis human occupation at the site is weak or nonexistent, as summarized by Stanford et al. (1981:26), "Human activity may account for part of all of the Pleistocene faunal remains, but until future studies are completed the evidence is meager, consisting of a few bone flakes and cores as well as a large river boulder."

CLOVIS PERIOD (12,000-11,000 BP)

The Clovis culture represents the first well-documented, widespread, and earliest universally accepted occupation of the New World. Clovis hunters lived during the terminal Pleistocene, and, although the climate was ameliorating, conditions were harsh compared to the present (Gilmore et al. 1997). Generally, conditions were wetter and cooler than in modern times. Now-extinct fauna, including mammoth and horse, occupied the region during this period. "The heavier rainfall deduced by geologists from the soil formations in which the elephant remains occur, as at Clovis, may have been reflected in a lush prairie grassland where there is now steppe or desert" (Wedel 1961:59). Archaeologists believe that Clovis people hunted mammoth, and Clovis points are often found in association with mammoth remains (Haynes 1966).

Clovis projectile points are usually between three and six inches long (Figure 4-2), basally ground, basally concave (Eighmy 1984:35), have parallel or slightly convex edges, and are leaf-shaped (Wedel 1961:54). The Clovis tool maker removed one or more flakes to create a flute or channel on each side of the biface (Howard 1990). Usually the flute broke out in a hinge fracture less than halfway to the tip of the point (Bradley 1991:370; Haynes 1966). Projectile points made of bone and ivory have been found at the Clovis site in New Mexico and elsewhere in the west (e.g., Alaska and California) indicating that bone tools were also an important part of the Clovis tool kit (Haynes 1966). Clovis points are believed to have been used as spear points.

Wedel (1961) stated that the Clovis tool kit also included large, sometimes triangular flakes with retouched edges, a few circular or oblong hammerstones, and a few items of worked bone. The bone objects included cylindrical shafts approximately 25 cm (10 inches) long and 1 cm (0.5 inch) in diameter that were beveled at both ends. These may have been foreshafts from spears or spear points (Wedel 1961:55).

It long has been assumed that Clovis hunters were opportunistic in nature, taking advantage of sick and wounded animals and driving animals into bogs or lakes before making the kill. However, based on observation of social behavior of the modern elephant, Frison (1991a) suggested that hunting practices would have had to have been much more organized than previously thought.

Table 4-1 lists the Clovis sites and an isolated find within the Platte River Basin of Colorado. Clovis remains are rare, but two excavated sites in eastern Colorado contained Clovis components in buried contexts. The Dent site, located southeast of the town of Milliken, was the first site to demonstrate an association between humans and mammoths. Examination of the context of the bones at the Dent site indicated that they had been redeposited. One interpretation is that the mammoths at the Dent site were animals that died from natural causes. Sometime prior to death, one or more of them had managed to escape a run-in with Clovis hunters, yet had retained evidence of the encounter in the form of points imbedded in their bodies (Cassells 1983:44-49). A more recent interpretation, however, returns to the idea that the mammoth were dispatched by human hunters and that there had once been a direct association between the artifacts and mammoth remains, even though those materials were disturbed by natural processes and later redeposited.

Bone samples from the Dent site indicated a range of dates from 11,200 ± 500 to 10,600 ± 90 BP, which are well within the accepted range for the Clovis period (Frison 1991a:25).

Additional evidence of Clovis occupation in the eastern half of Colorado includes undocumented sites on private land, such as the Klein site west of the town of Kersey (Holliday 1987), and isolated points found in surface or disturbed contexts. Figure 4-3 shows the distribution of Clovis sites and isolated finds within the Platte River Basin. Only sites that have undergone testing or excavation are discussed below; other sites listed in the table and on the distribution map are known only from surface information.

Dent Site (5WL269)

In 1932 floodwaters in the South Platte River exposed a deposit of megafauna bones in a terrace of the river near Dent, Colorado. Excavation of the site in 1932 and 1933 by Father Conrad Bilgery of Regis College in Denver revealed portions of at least 13 mammoths and two Clovis points (Bilgery 1935; Figgins 1933; Wedel 1961; Wormington 1957). Bilgery was joined by J. D. Figgins, who was known for his work at the Folsom site in New Mexico. According to Cassells (1997:59-60), Bilgery was not convinced that the mammoths had been killed by hunters, but rather thought that the bones and stone tools occurred together in mixed, redeposited soils.

Table 4-1. Clovis period sites and isolates.

Site Number	Site Name	Site Type
5BL5811		Isolated find
5LO24	Piel, Drake Cache	Open lithic, Burial (?)
5MR338		Open camp
5MR355	Bijou Creek	Open lithic
5WL1368	Klein Clovis; Klein II	Open camp
5WL1469		Open lithic
5WL269	Dent	Kill site

In 1973 a University of Colorado (CU) team, which included Joe Ben Wheat, Marie Wormington, Frank Frazier, and Vance Haynes (Cassells 1997), returned to the site to test areas that had not been previously excavated. During that work, an area of largely undisturbed stratigraphy was found and recorded (Haynes 1974; Spikard 1973). Radiocarbon dates from materials recovered during this work indicated that the deposits were mixed, supporting Bilgery's (1935) contention that a direct relationship between the stone tools and the mammoths was not indicated.

However, in recent years, Robert Brunswig has initiated a reinvestigation of the site, including soil coring in 1987 and 1988 (Brunswig and Fisher 1993). Information from this re-examination of the site suggests that the mammoth remains from Dent represent one or more matriarchal family herds killed some 11,000 years B.P. Even though the artifacts and faunal materials appear to have been redeposited, evidence of butchering on the mammoth bones and the

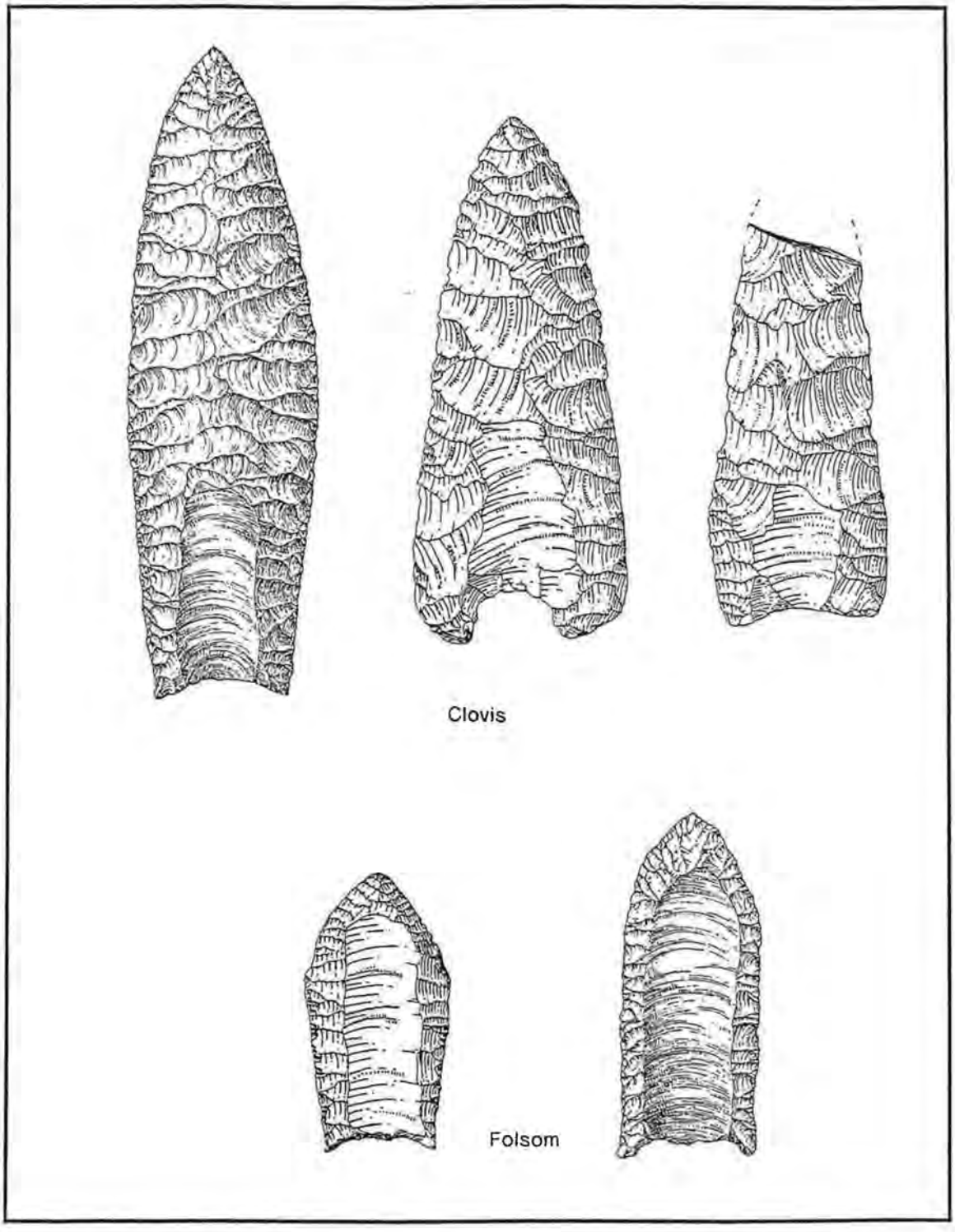

Figure 4-2. Clovis and Folsom projectile points, drawn to scale.

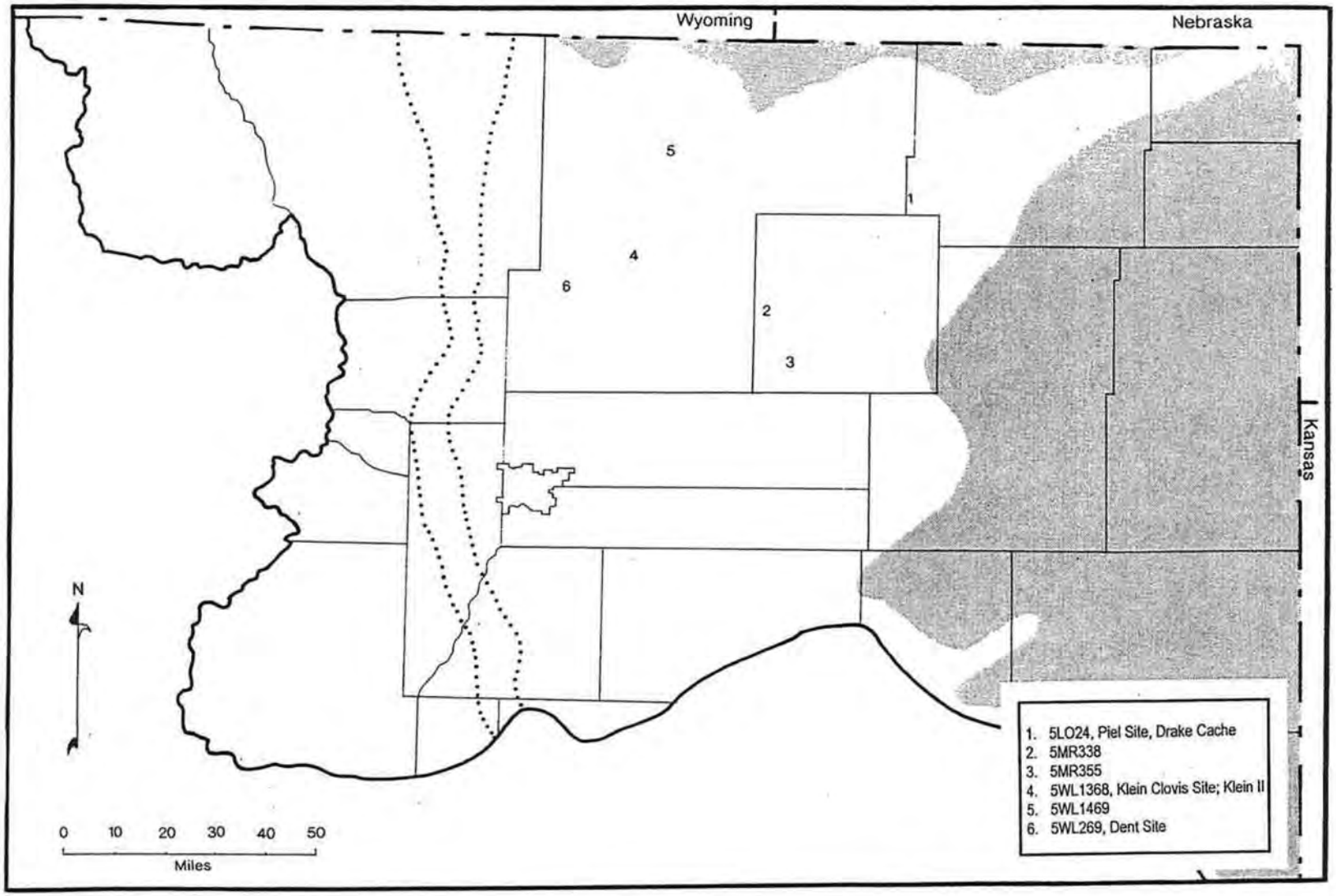

Figure 4-3. Distribution of Clovis sites.

presence of stone tools with heavy use wear argue that humans butchered the animals. Both the bones and stone tools were probably redeposited from some nearby site. The data suggest that the herd might have been ambushed in a narrow draw leading from a break in the sandstone bluffs on the eastern bank of the South Platte River. Brunswig and Fisher (1993:64) also suggest that the draw may have led to a river crossing below the site.

Klein Site (5WL1368)

The Klein site dates to the Clovis period and consists of stone artifacts along with mammoth and horse remains. The site is located south of U.S. Highway 34, 1.8 km (1.1 mi) west of the small town of Kersey in Weld County. The site is situated on the Kersey terrace (McFaul et al. 1991). Late Pleistocene/early Holocene gravel bars within the terrace now appear as broad, low ridges trending southwest/northeast (Zier et al. 1993:203). The Klein site is located on one of these ridges. The site was discovered by the landowner, Louis Klein, who found two Clovis points and mammoth and horse bones. Investigations were conducted there in the winter of 1990 and 1991 (Zier et al. 1993). In November 1990, the investigators placed 11 test holes 12.5 m apart along the ridge. During the following February, seven backhoe trenches were dug along the southern flank of the gravel ridge.

Artifacts collected from the site consist of two Clovis projectile points, a biface fragment that may be part of a Clovis point, a modified cobble, and a small chalcedony flake. However, these artifacts were not found in direct association with the mammoth and horse remains. According to Zier et al. (1993:208-209), the Klein site resembles other Clovis sites such as Colby (Frison and Todd 1986; Frison 1976, 1991) in its low density of artifacts and high number of tools compared to debitage. Although, the authors stated that: "This phenomenon may merely reflect the absence of intact occupational surfaces at most Clovis sites, the effects of reworking of archaeological materials by natural erosional processes, or the occurrence of projectile points in the bodies of mammoths that survived kill attempts and died at a later time . . ." (Zier et al. 1993:209).

Geomorphological study suggested that paleoenvironmental conditions were cool and moist on the Kersey terrace during the late Pleistocene and the early Holocene. Similar conditions prevailed at other sites such as Agate Basin, Carter Kerr-McGee, and Sheaman (Zier et al. 1993).

Dutton Site (5YM37)

At the Dutton site, discussed above in reference to the pre-Clovis period, a possibly Clovis occupation was identified by Stanford (1979). In the upper cultural level at Dutton, Stanford found a Clovis projectile point, a horse tooth, a chert core-chopper, two plano-convex scrapers, bone fragments, and several stone flakes. Those materials were found above a stratum that was radiocarbon dated to 11,710 ± 150 B.P. According to Cassells (1997:65), Stanford has interpreted the evidence as indicating a Clovis campsite.

Claypool Site (5WN18)

The Claypool site is best known for its Cody complex occupation, and the site is discussed in detail below in the section describing the Cody complex. However, Clovis points were also recovered in a mixed context at the Claypool site. The older Clovis artifacts and mammoth bones

were found on an erosional surface among artifacts associated with the Plano period (Cody complex) occupation. Interpretation of the Clovis component is difficult, as there are no remaining intact Clovis strata (Cassells 1983:49).

Drake Clovis Cache (5LO24)

This site was a cache of 13 complete Clovis points found by an artifact collector named Orvil Drake. The site is located east of Greeley between Pawnee Buttes and the South Platte River. Drake found three points on the ground surface where they had been uncovered by plowing. He and several friends dug within the cache and found the other points. Drake reported that the projectile points were clustered and shallowly buried. They also found several small white fragments that have since been shown to be ivory. The site was tested by Bruce Lutz, who requested that Dennis Stanford continue the investigation of the cache. The archaeologists found additional ivory fragments and a hammerstone in the immediate vicinity of the main find (Stanford and Jodry 1988).

The Clovis points from the cache were still very sharp and apparently had been buried "ready to use." The points range in length from 8.94 cm to 16.49 cm. Eleven of them are made of Alibates dolomite from Texas; the source material of the remaining two points has not been identified. The hammerstone, on the other hand, is made of chert local to the area where the cache was found (Stanford and Jodry 1988).

Interpretation

What does the above discussion tell one about the lifeways of Clovis people in the Platte River Basin? Unfortunately, not much can be said about Clovis life in the region beyond a few basic statements and some conjecture. Evidence from the Platte River Basin suggests that Clovis hunters killed mammoth and other large animals. There is not, however, substantial *in situ* association of Clovis artifacts and mammoth or other megafauna remains within the area. Elsewhere in the New World, however, there is good evidence for a direct association between hunters and mammoth. For example, at the site of Naco in Arizona, archaeologists found the remains of a mammoth with eight Clovis points imbedded in it (Haury et al. 1953), unequivocal evidence of mammoth hunting.

Frison (1991:143-155) has provided a detailed discussion of mammoth hunting during the Clovis period. The information we have, along with data from other areas of the U.S., suggests that Clovis bands were small and constantly on the move, following the herds of migrating animals. It appears that Clovis hunters sometimes cached tools and perhaps other items for retrieval at a later time. Human population during Clovis times was small and scattered. It also appears that some Clovis groups favored springs and waterholes, where mammoth and other megafauna came to drink and could be ambushed (Haynes 1964). Many mammoth kill sites are located in areas of low ground near springs, streams, or ponds. It may be that the soft ground found sometimes around these natural features aided in restricting the movement of the animals, making them more vulnerable to the hunters. Frison (1991) doubts that mammoths were driven into bogs, stating that such a technique would have made butchering difficult and also that mammoths — like modern elephants — could move through boggy soil without getting stuck. Instead, he believes that the hunters followed a group of mammoths and waited for the opportunity to spear a single creature, probably through the rib cage into the lung cavity. A single mammoth

kill could provide a band with enough meat to last many weeks, especially if some of the meat was dried. In addition, bones and tusks could be made into tools, and shelter and clothing could be made from the hide.

> Everyone agrees that the Clovis people hunted both big game and smaller animals as well, besides collecting wild vegetable foods during spring, summer, and fall. However, preservation conditions are such that it is the animal bones that have survived, so much so that there has been a tendency to overemphasize the meat element in the diet. But the Clovis folk were opportunists, like all hunters and foragers, and we can safely assume that they took big game whenever they could. They seem to have been especially fond of mammoth, for their bones are found at every site where bone survives. The hunters also favored now-extinct forms of bison, and on occasion they pursued horse, camel, tapir, bear, and rabbit (Fagan 1987:179).

Goshen Complex

This complex was defined from work at the Hell Gap site in east-central Wyoming (Irwin-Williams et al. 1973). Chronologically, the complex fits between the Clovis and Folsom complexes, and has been dated to 10,950 – 10,750 B.P. (Gunnerson 1987). Frison (1991a) has accepted the validity of Goshen, but others point to the similarities between Goshen projectile points and those of the Plainview complex (Gunnerson 1987:12). Even Frison acknowledged the difficulty in substantiating Goshen as a temporally separate complex:

> At the present time the data on Goshen are not sufficient to determine whether Henry Irwin was right in identifying Goshen as a Clovis variant, as he did in his dissertation (Irwin 1968), or whether it is a separate cultural complex between Clovis and Folsom. Only further research can resolve the problem. From the evidence to date we do know that the knappers in the Goshen group or groups developed what is basically a Folsom-type, pressure-flaking, projectile-point preform-reduction technology (Frison 1991b:149).

However, Frison (1993:7-8) later suggested that because Goshen materials were found "unequivocally" below a Folsom level, they can be considered separate.

The only reliable diagnostic artifacts that can be attributed to Goshen are projectile points. Goshen points are lanceolate with parallel to slightly convex or concave sides and concave bases. They resemble Clovis projectile points in their overall form (Irwin-Williams et al. 1973). Goshen projectile points exhibit characteristics that logically place them between Clovis and Folsom, supporting the stratigraphic evidence from the Hell Gap site. Again quoting from Frison (1991b:140): "Goshen projectile points demonstrate all the necessary prerequisites of lithic technology needed to accomplish the final stage of fluting as manifested in Folsom assemblages. In addition, many flakes modified for tool use and other debitage demonstrate a technological stage of platform isolation, faceting, and grinding that is almost identical to platform preparation on Folsom channel flakes."

In addition to the Hell Gap site, Goshen-type points have been found at the Mill Iron site in southeast Montana, the Carter/Kerr-McGee site in eastern Wyoming, Bentzen-Kaufman Cave in northern Wyoming, and from various surface finds throughout the Plains (Frison 1993). Goshen points have also been found in Middle Park, Colorado, at the Lower Twin Mountain site and at the

Upper Twin Mountain site along with a bison bone bed (Cassells 1997:70). To date, Goshen sites have not been identified within the Platte River Basin.

FOLSOM PERIOD (11,000-10,000 B.P.)

The Folsom period represents the adaptation to a change in environmental conditions at the transition between the Pleistocene and the Holocene. By Folsom times, the focus on hunting had shifted from the then-extinct mammoth to a species of bison that subsequently became extinct. Like the Clovis and Goshen periods that predated it, Folsom is identifiable by its distinctive projectile point. Folsom points are fluted, are smaller and lighter than Clovis points, and are distinctly better made (see Figure 4-2).

> They are more or less leaf-shaped in outline, broadest toward the tip which is either rounding or tapering, and have a concave base. The base frequently has two sharp rearward projections and sometimes a small nipple-like protuberance in the center. Highly characteristic is a broad groove on one or both faces, which runs from the base for two-thirds or more of the distance toward the tip, and results in two lateral ridges paralleling the edges of the blade. In cross section, this gives a biconcave appearance to the points. The edges have a fine secondary retouching, after which the base and the edges for about one-third of the length of the blade were blunted. In length, Folsom fluted points range from less than one inch to about three inches [Wedel 1961:61].

The Lindenmeier site, which is 35 km (22 mi) northeast of Fort Collins, is perhaps the best known Folsom site other than the type site in northeastern New Mexico. Other Folsom sites in eastern Colorado include Fowler-Parrish, a kill site in a sand dune near Orchard (Cassells 1983), and the Powars site, a campsite buried within aeolian sediments, southeast of Kersey (Holliday 1987; Wormington 1957). Figure 4-4 displays the distribution of Folsom period sites and isolates within the region.

Table 4-2 shows the Folsom sites and isolates for the Platte River Basin. There is an increase in documented components between the Clovis and Folsom periods. This may indicate an increase in population (Cassells 1983:51), or it may be a factor of site preservation and relative visibility (Gilmore et al. 1997).

Lindenmeier (5LR13)

The best information on the way of life of the Folsom hunters comes from Lindenmeier (Wilmsen and Roberts 1978; Wedel 1961). Unlike the majority of documented Paleoindian sites, Lindenmeier was a campsite, and it contained information about more than just bison hunting technology. Faunal remains from the Lindenmeier site demonstrated that, in addition to bison (*Bison antiquus*), Folsom people relied on a range of animal species including pronghorn, rabbit, fox, wolf, coyote, and turtle (Wilmsen and Roberts 1978). This evidence of increased reliance on a variety of species was supported by faunal remains at the Indian Creek site in southwestern Montana, which included bighorn sheep, marmot, cottontail, prairie dog, medium-sized artiodactyl, and various rodents in addition to the Folsom staple of bison (Davis and Greiser 1992).

Table 4.2. Folsom period sites and isolated finds.

Site Number	Site Name	Site Type
5AH282		Isolated find
5AH64		Isolated find
5DA38		Open camp
5EL14	Rosenthal-Sagar	Stone quarry, open camp
5LN46		Open lithic
5LR13	Lindenmeier	Kill site, open camp
5LR17		Open camp
5LR30		Open lithic
5LR382		Open camp
5LR525		Open camp
5MR169		Open lithic
5MR176		Open Camp
5MR355	Bijou Creek	Open lithic
5MR26		Open lithic
5PA1	Antelope Springs	Open architectural
5PA180		Open lithic
5PA95		Open lithic
5WL100	Fowler-Parrish	Kill site
5WL1238		Open camp
5WL1369	Powars	Open camp
5WL182		Open camp
5WL195		Open lithic
5WL218		Open camp

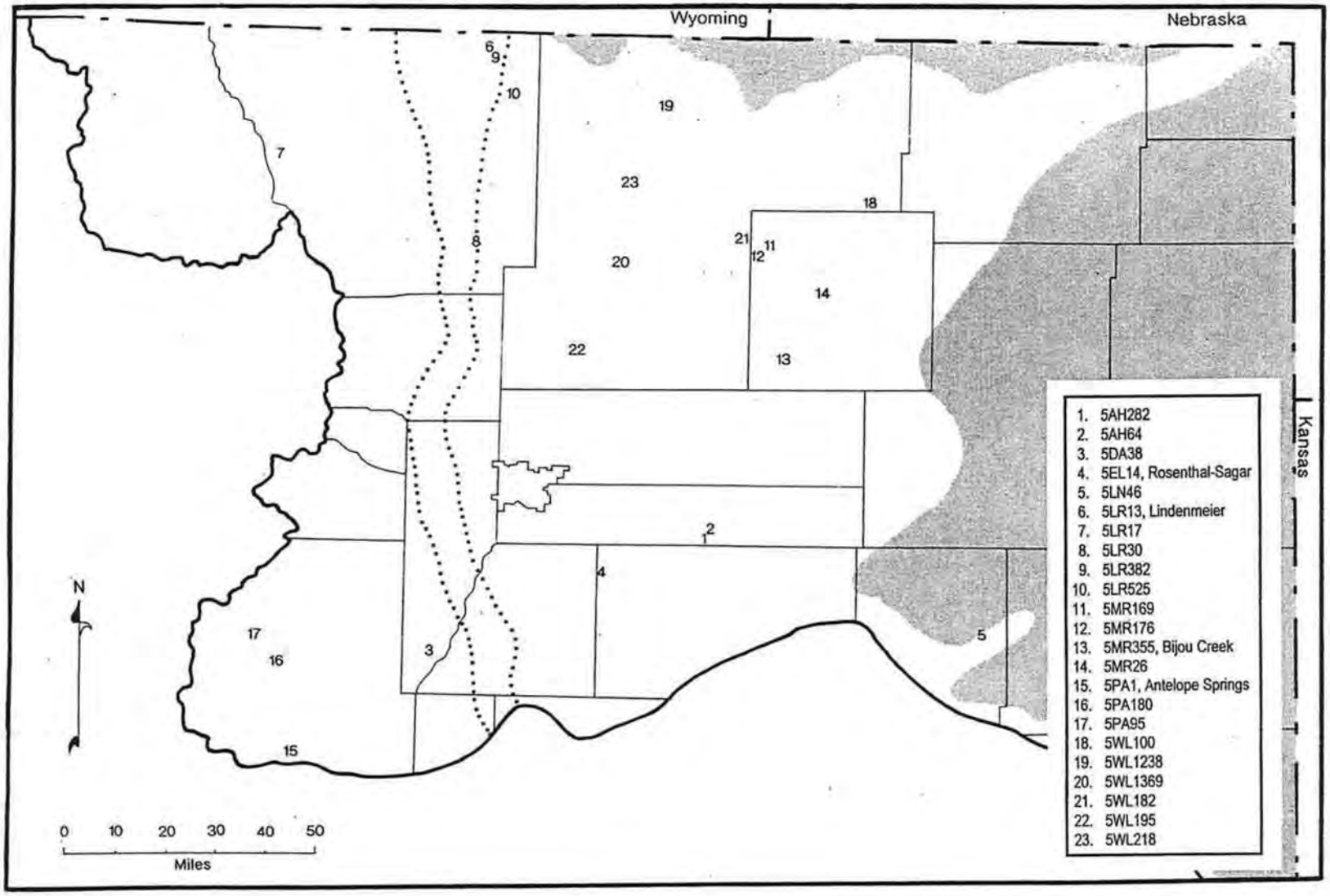

Figure 4-4. Distribution of Folsom sites.

Frank Roberts excavated at the Lindenmeier site from 1934 through 1940 (Roberts 1935a, 1935b, 1936a, 1936b, 1937a, 1937b, 1938, 1940a, 1940b, 1941). The site had been discovered in 1924 by Judge Claude Coffin, Lynn Coffin, C. K. Coffin, and Major Roy Coffin, the latter being professor of geology at Colorado State College. Numerous scholars, many of whom went on to distinguished careers, worked at Lindenmeier (Wilmsen and Roberts 1978). For example, the well-known anthropologist and writer Loren Eiseley excavated there during the 1935 field season.

Excavation at Lindenmeier was extensive: archaeologists at the site excavated a total of 1800 m^2, along with 23 additional test pits. Thirty-one excavators conducted 580 person-days of field work, producing 1557 pages of field notes and assigning 5478 catalog numbers for chipped stone. They collected 46,380 waste flakes and between 10,000 and 20,000 animal bones (Wilmson and Roberts 1978). The Folsom level at the Lindenmeier site had an associated averaged radiocarbon range of 10,660 ± 60 B.P., or 8710 B.C., uncorrected (Haynes et al. 1992).

The Lindenmeier site is situated in an old valley. According to Wedel (1961:62), the bordering ridge on the south of that valley has been eroded away, leaving the former valley floor in the form of a terrace. Evidence indicates that the valley once contained meadows and marshes that would have been attractive to bison and other animals. The layer containing Folsom materials at the site is a dark soil that probably resulted from the decay of heavy vegetation. A reliable water supply, gravels that included materials suitable for production of tools, and a sheltered camping location drew Folsom hunters to the location (Wedel 1961:63).

In addition to Folsom points, stone artifacts included end and side scrapers, spoke shaves, chopping tools, large blades, drills, and gravers (Wilmson and Roberts 1978). It appears that channel flakes, produced when the projectile points were fluted, were sometimes retouched and used as knives (Wedel 1961). Other artifacts included hammerstones, small ground stone tablets, grooved sandstone blocks, and rubbing stones. Bone tools were also recovered by the excavators, including awls, punches, needles, possible beads, and what appear to be incised gaming pieces.

Powars Site (5WL1369)

Another Folsom site, Powars, was dug in the 1930s by the amateur archaeologist for whom it is named. The site was briefly reported by Frank Roberts (1937a, 1940b), who also excavated there. The site is located near Kersey on a low terrace on the south side of the South Platte River. Evidence suggested to Roberts that it was a short-term campsite. There was evidence of tool manufacture in that numerous flakes and broken implements were scattered throughout the site. Some animal bone was found, but it was all very fragmentary and could not be identified to species. The cultural deposits at Powers were shallow and the site appeared to have been severely deflated (Roberts 1937a:69).

Fowler-Parrish Site (5WL100)

This site is located in the South Platte drainage near Orchard, Colorado. Seventeen whole or fragmentary Folsom points were found at the site, as were two separate bison bone beds. It was discovered in 1962 by Neil Fowler, who found several Folsom points eroding from the ground in a blowout. Fowler asked Al Parrish, a former anthropology student at the University of Colorado, to examine the site. The two of them discovered a bone concentration in association with Folsom artifacts. Because of the potential for information on early man and the Folsom complex, Fowler

and Parrish sought the help of professional archaeologists by contacting Marie Wormington. Although Wormington acted as the project coordinator, the fieldwork was directed by George Agogino. The crew for the project consisted of students from the Hell Gap excavation, which was on going at the time (Agogino and Parrish 1971).

The Fowler-Parrish site is situated in an ancient sand dune, which was heavily deflated by the time of excavation (Cassells 1997). The archaeologists excavated 24 pits measuring 1.5 m (5 ft) on a side, uncovering two levels of bone. The bone was from bison and appeared to be from the extinct *Bison antiquus*. The archaeologists found stone flakes among the bone layers but no diagnostic artifacts. Agogino and Parrish (1971) interpreted the site as having been a bison kill, but added that apparently the hunters remained there for some time, due to the large number of flakes, which suggested tool manufacture or tool replenishment. The points from the site were typical of the Folsom complex, except that they displayed a high degree of oblique marginal retouch. Agogino and Parrish (1971:114) attributed this to the site being located on the eastern-most extent of the territory occupied by the Folsom complex.

Johnson Site (site number unknown)

The Johnson site is a small Folsom campsite located north of La Porte, Colorado, some 24 km (15 mi) southwest of the Lindenmeier site. It was discovered and reported by T. Russell Johnson, a local collector. Marie Wormington, from the Denver Museum of Natural History (DMNH), examined the site in the summer of 1936. Because the site was deflated, Wormington did no additional work there. Archaeologists returned to the site in 1960 (Galloway and Agogino 1961), but the deflation was even more severe, with indications that the remains of several cultures had become mixed. Prior to leaving the site, Galloway and Agogino (1961) excavated five units measuring 0.9 × 1.8 m (3 × 6 ft). Sometime later, Louis Steege of the Wyoming State Historical Museum dug a 12 m (40 ft) long trench, parallel to the row of pits. No faunal materials or charcoal were evident, so Galloway and Agogino (1961:205) collected several Folsom projectile points and then halted the project. The excavators believed that because of the disturbed and deflated nature of the site, nothing new could be learned concerning life during the Folsom period.

Interpretation

Archaeologists have somewhat more information about life during the Folsom period than they do for the preceding Clovis period. For example, there is evidence of the actual campsites of Folsom hunters in addition to sites where animals were killed and/or processed. Lindenmeier is an example of such a campsite and is believed by Wilmsen (Wilmsen and Roberts 1978) to have been used by at least two semiautonomous bands, which cooperated in such endeavors as bison hunting.

Indications are that Folsom hunters were able to kill small numbers of now-extinct forms of bison on a regular basis. There is no evidence of large communal kills (Frison 1991), such as those found at later Paleoindian sites (e.g., Olsen-Chubbuck), but this could have been because of smaller band size and lower human population levels in general, with a correspondingly smaller need for large supplies of meat. A bison kill at the Agate Basin site was small, consisting of nine animals, and the fragmentary remains of seven others were found in Folsom components elsewhere at the site (Frison 1991a).

Sites like Lindenmeier also provide indications that the Folsom hunters stayed in some campsites for extended periods. At the Hanson site in northeast Wyoming, excavators found three hard-packed areas that could have been circular lodge structures, suggesting that Folsom people not only camped for extended periods, but also constructed shelters (Frison and Bradley 1980). There is also evidence for a more varied diet during this period, with smaller animals being hunted in addition to bison. Folsom people were expert craftsmen.

> Folsom represents what might be described as a climax in lithic technological achievement since their pressure flaking was of the highest quality recognized world wide. The purpose of the fluting process remains unexplained and may have been more of an art form rather than functional. Both stone and bone tool assemblages are indicative of a high degree of fine workmanship. This is indicated by small pieces of delicately incised bone at the Agate Basin and Lindenmeier sites presumably for decorative purposes. Eyed bone needles that compare favorably with present-day metal examples suggest fine work possibly in clothing manufacture (see Frison and Craig 1982). This excellence of workmanship probably carried through into wood and other perishables as well (Frison 1991a:51).

PLANO PERIOD (10,000-7500 B.P.)

Plano components are well represented within the Platte River Basin. The Plano period represents a florescence of diversity in large, unfluted lanceolate projectile point styles. Plano complexes documented in eastern Colorado include Hell Gap, Agate Basin, Cody, Firstview, and Kersey. Plano period sites and isolates in the Platte River Basin are listed in Table 4-3 and their distribution is shown in Figure 4-5. The site-type designations are taken from the OAHP database. Many of those designations are apparently based only on surface evidence, which may not be conclusive. Very few of the Plano sites can be assigned to a complex.

The Plano period represents a continuation of the pattern established in the previous periods, greater diversity of resources exploited, and indications of increasingly sophisticated hunting techniques that were possible due to a hypothesized increase in social complexity. In the earlier Clovis and Folsom periods, kill sites are thought to represent relatively few animals killed by small bands of people; during the Plano period, there was an increase in the number of animals killed at one time, which implies a greater number of interested participants in the hunt. A change also occurred in the complexity of the methods employed: large numbers of animals were driven into topographic traps, such as steep-walled arroyos (Olsen-Chubbuck) or snowdrifts, as is speculated by the excavators of the Jones-Miller site. Such strategies would have taken a much greater number of organized participants, which, in turn, implies a different level of social complexity than is apparent in previous periods (Stanford 1975; Wheat 1967).

Although the number of Plano period kill sites excavated does indicate a very real reliance on large game, plant resources and smaller game appear to have played a greater role in late Paleoindian adaptive strategies. Evidence from excavations at sites in the central Rocky Mountains of Wyoming demonstrates that semi-sedentary people of the late Plano period adapted to the foothills and mountains and had a broad-based economy that was more similar to Archaic adaptations than to those of the big game hunters inhabiting the Plains at the same time (Frison 1991a, 1992).

Table 4.3. Plano period sites and isolates.

Site Number	Site Name	Site Type	Complex
5AM14	Badger Hill	Open camp	?
5BL181		Isolated find	?
5BL201		Open camp	Cody (Scottsbluff)
5BL232		Open lithic	Cody (?)
5EL14	Rosenthal-Sagar	Stone quarry, Open camp	?
5EL19		Open camp	?
5JA47		Open architectural	?
5EL64		Open camp	?
5EL68		Open camp	?
5JA231		Open lithic	?
5JA238		Open camp	?
5JA240		Open camp	?
5JA245		Open camp	?
5JA254		Open camp	?
5JA295		Open camp	?
5JA304		Open camp	?
5JA421	Sue Site	Open camp	?
5LO19	Frasca	Kill site	Cody
5LR489		Sheltered camp	?
5MR61		Open lithic	?
5MR338		Open camp	?
5MR355	Bijou Creek	Open lithic	?
5PA1	Antelope Springs	Open architectural	?
5PA94		Open camp	?
5PA106		Open camp	?
5PA107		Open camp	?
5PA113		Open camp	?
5PA121		Open lithic	?
5PA233		Isolated find	?
5PA268		Open lithic	?

Table 4.3. Plano period sites and isolates.

Site Number	Site Name	Site Type	Complex
5PA485		Isolated find	Alberta (?)
5SW12		Open camp	?
5SW21		Open lithic	?
5WL12		Unknown	?
5WL23		Kill site	?
5WL45	Wilbur Thomas Rockshelter	Sheltered camp	Cody
5WL46	Keenesburg	Open camp	?
5WL53	Jurgens	Open camp	Kersey
5WL182		Open camp	?
5WL268	Frazier	Kill site	Agate Basin
5WN18	Claypool	Open lithic	Cody
5WN26	Nelson	Kill site	?
5YM7		Kill site	?
5YM8	Jones-Miller	Kill site	Hell Gap

Hell Gap Complex

This complex was named after several occupations in the vicinity of Hell Gap in east-central Wyoming (Gunnerson 1987:16; Irwin-Williams et al. 1973). Irwin-Williams et al. (1973) assigned the complex a temporal range of 8000 to 7500 B.C.

Hell Gap projectile points (Figure 4-6) are very similar to Agate Basin points, except that they have a straight base with an expanding stem and a shoulder (Gleichman and Gleichman 1989:25). The bases are straight or slightly convex, and the cross sections of the points range from thin ovals to almost diamond shaped. Basal grinding was pronounced (Agogino 1961:558). Other than projectile points, artifacts from Hell Gap included side scrapers, a few end scrapers, large bifacial knives, notched scrapers, spur perforators, and utilized flakes (Gunnerson 1987:16).

Jones-Miller Site (5YMS)

The Jones-Miller site was excavated during the summers of 1973, 1974, and 1975 by the Smithsonian Institution under the direction of Dennis Stanford (1974, 1975, 1984). The site was discovered by Robert Jones, Jr., during construction of a pivot irrigation system on his property in 1972. Jones brought the site to the attention of Jack Miller, a former professor of anthropology at Colorado State University (CSU). Miller conducted test excavations at the site, and then notified

James Judge at the University of New Mexico, who in turn contacted the Smithsonian Institution. Because of the site's potential for providing important information on the Paleoindian occupation of the region, full excavations were initiated (Stanford 1984).

The site is located on a tributary of the Arikaree River in northeastern Colorado, near the town of Wray. The excavators found a bison bone bed in two small draws that cut into the third terrace of the Arikaree River. The main bone bed averaged 30 m x 20 m (98 x 66 ft). The remains of approximately 300 disarticulated *Bison antiquus* were recovered from the site. Associated with the bones were several Hell Gap projectile points. Although of the Hell Gap type, the points had slight shoulders "approaching" the Agate Basin type (Stanford 1984:92). Thirty-one complete points and 73 broken points were recovered. Along with the projectile points, Stanford and his crew found more than 130 flaked stone artifacts and 200 bone artifacts. The flaked stone tools included several side scrapers and one end scraper.

Agate Basin Complex

The Agate Basin complex was named after the site of that name in eastern Wyoming (Frison and Stanford 1982; Roberts 1943). The Agate Basin complex is not well represented in Colorado, with the Frazier site being the only documented example (Cassells 1997), although isolated projectile points were reported for the foothills region near Denver (Gunnerson 1987). The Agate Basin site was a bison kill, with a butchering and processing area located nearby. One of the best represented complexes at Hell Gap was the Agate Basin complex, dating to 8500 to 8000 B.C. (Gunnerson 1987:21). Agate Basin points are often long and have straight or slightly biconvex outlines that expand toward the center from both ends (see Figure 4-6). They have no shoulders, but the lower lateral edges are sometimes heavily ground (Cassells 1997:81). Other artifacts found at Agate Basin sites include scrapers, notched flakes, spur perforators, retouched flakes, utilized flakes, end scrapers, bifacial knives, and an occasional bone tool such as needles (Irwin-Williams et al. 1973:47).

Frazier Site (5WL268)

The Frazier Site was found on the Kersey terrace along the South Platte River by Frank Frazier in 1965. Frazier reported the site to Marie Wormington, who conducted a testing project that revealed stone tools along with bison bone. She then conducted excavations at the site over the next two field seasons (Cassells 1997:81).

Wormington's excavation discovered the remains of approximately 43 bison. The incompleteness of the skeletal remains suggested that the site was not the location of the kill, but merely the butchering and processing area. In Cassells' (1997) opinion, however, the large number of bones would argue for the kill site being located nearby.

Cody Complex

The Cody complex is a widespread Paleoindian complex ranging from Alberta and Saskatchewan south all the way to northeastern New Mexico (Frison 1976, 1978; Frison and Wilson 1975; Gunnerson 1987; Wormington 1957). The diagnostic artifacts associated with the Cody complex consist of Eden points, Scottsbluff I, II, and III points, and the distinctive Cody

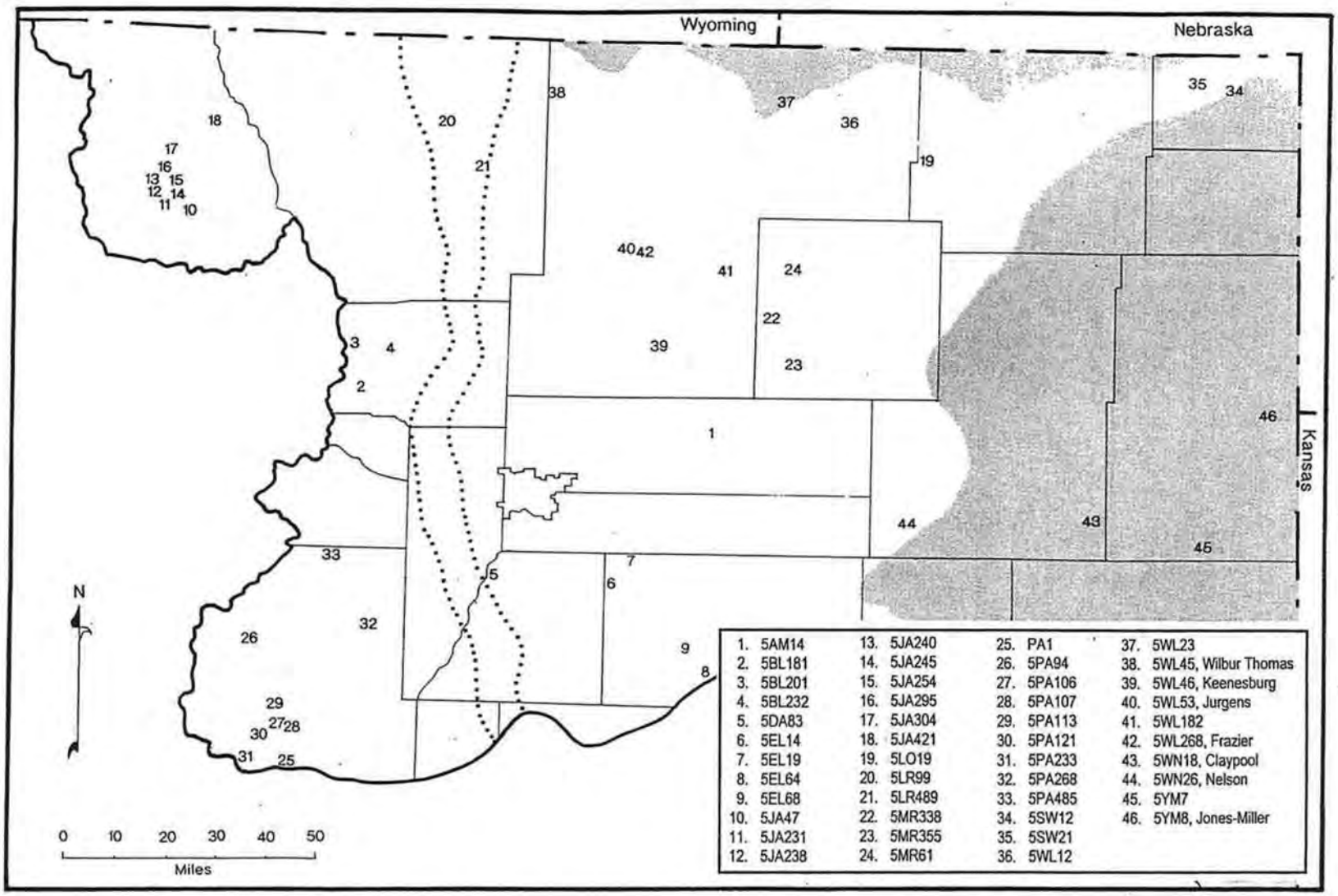

Figure 4.5. Distribution of Plano sites.

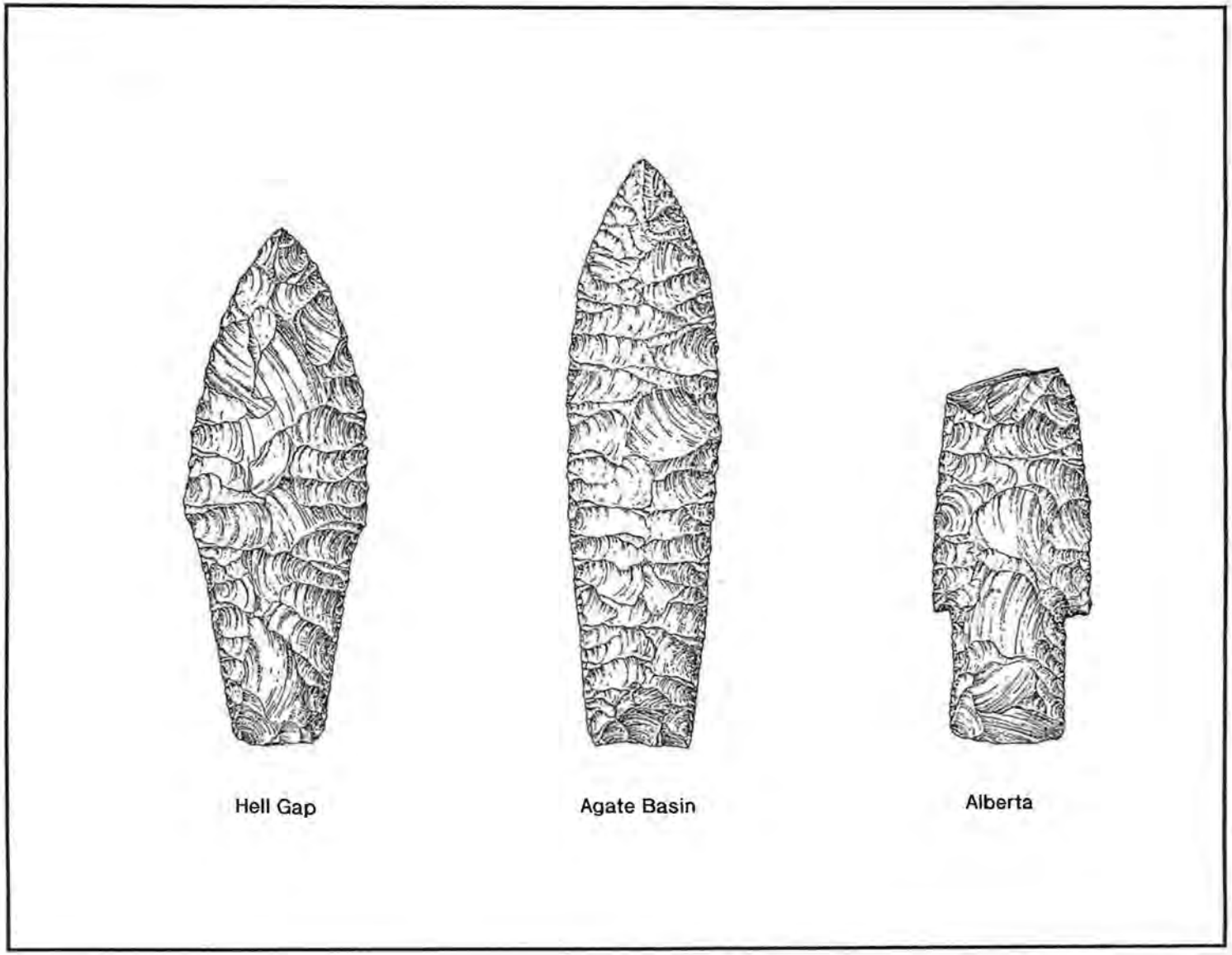

Figure 4.6. Hell Gap, Agate Basin, and Alberta points. Artifacts are drawn to scale.

knife (Figure 4-7). Cody knives are stemmed tools, with the stem at an angle up to 46 degrees from the cutting edge of the blade (Agenbroad 1978:161). The type site for the Scottsbluff point is the Scottsbluff Bison quarry, near Scottsbluff, Nebraska, and the type site for the Eden point is the Finley site near Eden, Wyoming. The Cody complex was named for the Cody area of northwestern Wyoming, where it was identified at the Horner site (Gunnerson 1987; Jepsen 1953). This complex has been dated at the Horner and Finley sites from 9000 B.P. to 8800 B.P. (Gleichman and Gleichman 1989:26) or 8800 B.P. to 8400 B.P. (Gunnerson 1987:22). In the Platte River Basin, the Cody complex has been identified at the Claypool, Lamb Spring, Frasca, and Caribou Lake sites. Agenbroad (1978) places Alberta points in the Cody complex based on findings at Hudson-Meng.

Claypool Site (5WN18)

The Claypool site has been assigned to the Cody complex. It is located 31 km (19 mi) south and 6 km (4 mi) east of the town of Otis in Washington County (Dick and Mountain 1960). The site was excavated in 1953 by the University of Colorado Museum, following years of artifact collecting by local residents, including Bert Mountain. At the time of excavation, the site was situated in a blowout in an area of stabilized dunes, some of which rose to heights of more than 15 m (50 feet). Several years after the archaeological work, Dick and Mountain (1960) reported that the site was grassed over and was no longer being eroded by the wind. Additional excavations were conducted at Claypool in 1975 by the Smithsonian Institution (Stanford and Albanese 1975).

Claypool appears to have been a campsite, rather than merely a location where game was killed (Dick and Mountain 1960:225). Diagnostic artifacts found there included Eden points, a Scottsbluff point, and a Cody knife. Other material culture consisted of scrapers, numerous stone flakes, charred and uncharred bone, and pieces of grooved sandstone. The stratigraphy at Claypool consisted, from the ground surface downward, of modern sand deposits, deposits from the sand hills surrounding the site, a layer of brown sand, a layer of calcareous sand, and a bed of marl and coarse sand. Artifacts were recovered from the brown sand layer (Dick and Mountain 1960:225), which Malde (1960) identified as a postglacial deposit dating to about 10,000 to 7000 years ago.

Frasca Site (5LO19)

The Frasca site is a bison kill and processing site. It is located approximately 32 km (20 mi) northwest of Sterling. The site is located on a ranch owned by Charles Frasca, who reported that bones had been eroding from the cutbank of Pawnee Creek for decades. Evidence of the association between humans and extinct fauna, however, had not been observed there until 1978, when a Cody projectile point was found by collectors (Fulgham and Stanford 1982).

To collect data from the site before it was destroyed by erosion, the Smithsonian Institution excavated there in the fall of 1979 and the summer and fall of 1980. The site consisted of two locales containing bone. The main area covered approximately 28 m^2 and was 50 cm thick, whereas the second area was a small, thin scatter of bone located about 100 m southwest of the main concentration (Fulgham and Stanford 1982).

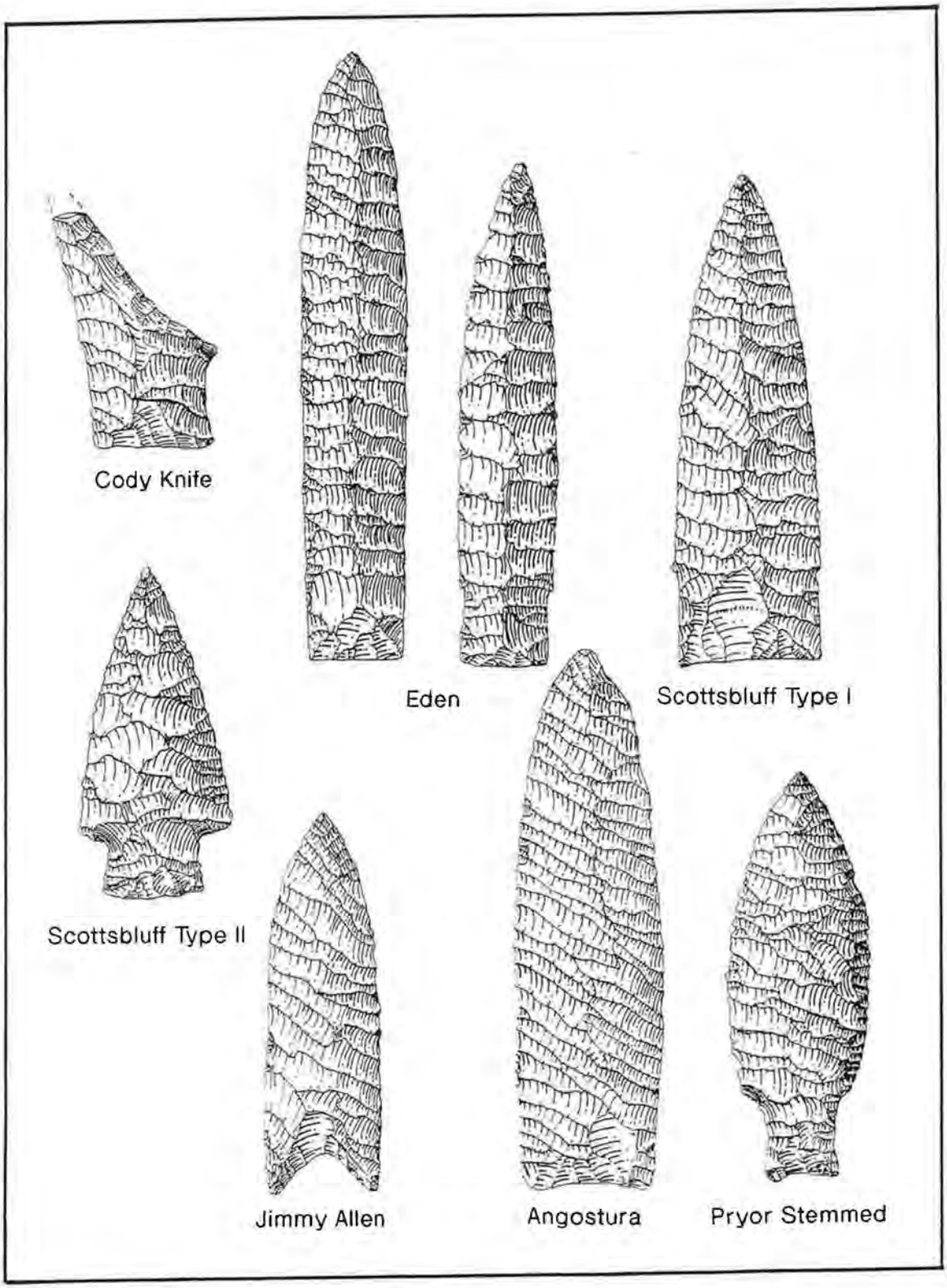

Figure 4-7. Cody complex and late Paleoindian projectile points. Artifacts drawn to scale.

Lamb Spring Site (5DA83)

Excavators found a bison bone bed in the lower portion of Unit 2 at the Lamb Spring site. Along with the bone bed, they found a Cody point and the midsection of a Cody point. Additional Cody artifacts were found at the site. Radiocarbon dates from bone collagen taken from Unit 2 place the occupation late in the temporal range of the Cody complex (Stanford et al. 1981).

Nelson Site (5WN26)

Nelson is another site apparently of the Cody complex. It is located 16 km (10 mi) upstream from the Frasca site and appears to retain in situ artifacts (Cassells 1997:85). A bone sample from the site provided an age of 7995 ± 80 B.P. The State of Colorado site form for Nelson lists Steve Cassells as the recorder. According to the form, the site consists of a thin exposure of bison bones over roughly an acre in a gully floor, along with apparently Plano artifacts. The site was visited in 1981 by George Frison and personnel from the Colorado Preservation Office. Frison and Dennis Stanford believed that the site had potential as a kill site. According to Cassells (1997), access to the site is currently being denied.

Wetzel Site

Cassells (1997:85) reported that Dennis Stanford examined a site named Wetzel that appears to belong to the Cody complex. The site was almost destroyed by the time Stanford saw it, but he observed Cody artifacts and bison bone. The bone was dated to 7160 ± 135 B.P.

Kersey Complex

The Kersey complex was formulated by Joe Ben Wheat to describe materials recovered at the Jurgens site (Wheat 1979). He suggested that the complex is a regional development of the stemless lanceolate projectile point tradition. According to Wheat, the Kersey and Firstview complexes (discussed below) represent this tradition on the Southern and Central Plains, whereas the tradition includes the Alberta-Scottsbluff-Eden complex on the North-Central and Northern Plains. It appears that the contact area, and area of interaction, between the northern and southern complexes of the Plano period was the South Platte drainage (Gleichman and Gleichman 1989).

Jurgens Site (5WL53)

Few archaeologists in the twentieth century became leading figures in the study of more than one region and of more than one cultural group. Joe Ben Wheat, who excavated the Jurgens site — and who was also known for his work on the Mogollon and Anasazi — was one of those rare scholars. Wheat is perhaps most famous for his study of the Paleoindian stage. The report on excavations at Jurgens (Wheat 1979) is one of the most detailed and thorough descriptions of a Paleoindian site in Colorado, or anywhere in the New World.

Jurgens is located about 1.6 km (1 mi) north of Kersey and 14 km (9 mi) east of Greeley. The site was found in 1965 by geologist Frank Frazier after the landowner, George Jurgens, leveled the area to improve it for irrigation. The site was tested by Frazier and Henry Irwin. One of their test pits revealed a bone bed with two associated projectile points and several other stone

artifacts (Wheat 1979). Excavation of the site began in 1968 under the direction of Joe Ben Wheat and Marie Wormington.

The Jurgens site consisted of three separate areas, each of which represented a different kind of activity. Area 1 appeared to be a long-term camp or habitation area; Area 2 was a short-term camp; and Area 3 was a butchering or processing area. One sample of charcoal from Jurgens was radiocarbon dated at 9070 ± 90 B.P. (Wheat 1979:151).

Unlike kill sites such as Olsen-Chubbuck, discussed below, Area 3 of Jurgens appeared to not have a natural trap in which the animals had been killed. Wheat (1979:147) reported that his crew found neither whole or nearly whole skeletons, and there were no complete skulls and few skull fragments. The parts that were found included forelimbs, hind limbs, and segments of vertebral columns. Those were all units that could have been easily transported from a nearby kill site. Numerous foot units were also found in Area 3, and Wheat (1979) explained this by stating that the feet had served as handholds for the transport of leg units from the kill to the butchering area.

Area 1 at Jurgens also had no evidence of a game trap and no whole or nearly whole skeletons. The bison bones found there were from legs and vertebral columns, and the breakage of bones was even greater than in Area 3. Along with the bison remains, the excavators found bones from 20 other species of animals. This suggested to Wheat that hunters had supplied the camp with meat on a day-to-day basis, and that the situation was not one of a single-purpose butchering operation (Wheat 1979:147-148).

Area 2 consisted of portions of two bison and five pronghorns. There was not the same evidence of processing of animals or of extended human occupation. Wheat (1979) interpreted the use of the area as that of short-term camping by a band of hunters.

The excavators of the Jurgens site found 2635 stone and bone artifacts; 63 of them were projectile points and point fragments, 30 were ground stone objects, 55 were stone and mineral specimens, 9 were bone artifacts, and the rest were flaked stone tools and debitage (Wheat 1979). Wheat coined the term "Kersey points" as the moniker for projectile points from the site. He described them as long, relatively narrow, unstemmed points with parallel flaking. The flakes terminate at a median ridge, and the cross sections of the points are diamond shaped. The points are usually parallel-sided for approximately two-thirds of their length before they curve to a sharp tip. However, some examples taper gradually from the base to the point. The points range in length from 95 to 130 mm and are from 17 to 24.2 mm wide. The bases tend to be straight and squared at the corners. They are not stemmed, but the tool makers ground the hafting area laterally (Wheat 1979:77).

Examination of the Kersey points suggests that they are very similar to Eden points. Wheat (1979:152) stated:

> Archaeologically, the stemless, parallel-sided projectile point of the Kersey Complex appears as a regional development of the stemless, lanceolate projectile point tradition represented by the Firstview and Milnesand Complexes of the Southern and Central Great Plains. In this tradition, stemming of projectile points occurs in both Firstview and Kersey Points only on pieces salvaged from broken primary points by reworking, while broken

Milnesand Points were salvaged by a continuous reduction which maintained the essential lanceolate character of the primary point morphology.

This essentially southern development roughly parallels the development of the Alberta-Scottsbluff-Eden (Cody Complex) stemmed projectile point tradition of the North-central and Northern Great Plains. Radiocarbon dates for the Southern Plains lanceolate tradition range from the 8200 + 500 B.C. date (A-744) for the Olsen-Chubbuck Site, with the Firstview Complex, to 7120 + 90 B.C. for the Jurgens Site, with the Kersey Complex.

Firstview Complex

Wheat (1972, 1978) devised the Firstview complex on the basis of material found at the Olsen-Chubbuck site, near the small town of Firstview. Initially, he assigned projectile points from the site to the Eden, Scottsbluff, and Milnesand types. However, after further analysis Wheat decided that most of the points from the site should be assigned to a new type, Firstview. Wheat (1972:152) said that Firstview points are a major type in the Southern Plains. He placed their center of distribution in the Clovis-Portales area of New Mexico. He also believed that the Olsen-Chubbuck site was their most northerly reported occurrence (Gunnerson 1987).

Olsen-Chubbuck Site (5CH1)

Although located just south of the boundary between the Platte River Basin and the Arkansas Basin, and therefore outside of our study area, the site of Olsen-Chubbuck provides so much information concerning the hunting, butchering, and consumption practices of the Plano period people in Colorado that it is worthwhile discussing here. The reader should, however, be aware that the site is located within the Arkansas Basin and that it is described in that context report. Olsen-Chubbuck was a bison kill site at which were found the remains of close to 200 bison of the extinct form *Bison occidentalis* (Wheat 1967, 1972). The site was discovered and partially excavated by two amateur archaeologists, Sigurd Olsen and Gerald Chubbuck. The site was excavated by archaeologists from the University of Colorado Museum under the supervision of Joe Ben Wheat in 1958 and 1960. The excavators did such a thorough job and the findings were so spectacular that the results were widely publicized (Cassells 1997).

Wheat and his colleagues found the remains of the bison in the bottom of an arroyo. It appeared that the Paleoindian hunters had stampeded the animals in a north-south direction toward the arroyo. The lead bison were unable to stop or turn, probably because of the force of the animals behind them, and they fell into the arroyo where they were trapped or killed by animals falling on top of them (Wheat 1967, 1972). Projectile points among the remains of the animals indicate that those not killed by the fall or the weight of the other animals were dispatched by the hunters.

Through careful analysis of the bison remains and their context, the excavators were able to determine, with some confidence, the butchering procedure followed by the hunters. They also discovered that the bison at the bottom of the arroyo had not been butchered or that only a small amount of meat had been removed from those carcasses (Wheat 1967, 1972). Based on the bone stratification at the site and on the practices of the later aboriginal inhabitants of the plains, the excavators reconstructed the butchering process as follows: 1) the front legs and the flesh just

under the hide were removed, 2) next the hump meat was removed, 3) then the rib meat and inner organs were extracted, 4) followed by removal of the pelvic girdle, 5) then the hind legs were removed, and 6) finally the neck meat and tongue were taken (Wheat 1967:53). Wheat also determined, based on knowledge of the breeding season of modern bison, that the kill occurred in late May or early June. This was based on the presence of the bones of calves that had been only a few days old at the time they were killed (Wheat 1967, 1972).

Wheat used estimates of the amount of meat available from the kill and such information as the rate of spoilage of meat to suggest that the band of Paleoindians might have numbered as many as 150 people. The kill and the process of butchering at the site appear to have been well organized. That, along with the band size suggested by Wheat, would argue that the hunters and their entourage were fairly highly organized — as Wheat himself points out, more highly organized than historic Plains Indian hunters (Wheat 1967:52). However, some of the assumptions that Wheat used to estimate the band size can be questioned. For example, he stated that 100 people could have butchered the animals in half a day. Although this is perhaps true, it also suggests that 25 people could have done it in two days. Carrying this further, it is possible that more of the meat was dried than Wheat estimated, reducing its carrying weight and perhaps allowing some of it to be cached. It is also possible that the hunting group was made up of several bands joined in a cooperative effort. Whereas the evidence does suggest a fairly well-organized butchering process, it does not provide clear evidence of the number of people involved or of Paleoindian band size.

Foothills/Mountain Complex

Frison (1992) identified what he believes is a difference between the big game-hunting Paleoindians of the plains and the Paleoindians who occupied the foothills and the mountains of the Rocky Mountain region. The latter pursued game smaller than bison, such as bighorn, elk, and deer, and foraged for vegetal foods such as nuts from the limber pine (*Pinus flexilis*) (Frison 1992:333; Frison and Grey 1980). According to Frison (1992:329), "Another contrast between classic open-plain Paleoindian sites and those in the foothills-mountains is that the latter produce fewer diagnostics, so that the ranges of variation in projectile point types is poorly known. This may reflect the absence of large-animal kill sites in the latter area. In addition, it is rare in the foothill-mountain sites to find the wide range of raw-stone flaking material from distant sources that is commonly found in the classic Paleoindian sites. Instead, most stone flaking material are localized to sources in the general area of each site."

Evidence of Clovis and Folsom people in the mountains of the Platte River Basin is meager. Clovis projectile points have been found in Rocky Mountain National Park at an elevation between 3353 and 3505 m (11,000 and 11,500 ft) (Guthrie et al. 1984; Husted 1965), and Folsom points have been reported near North Park (Guthrie et al. 1984). Benedict (1992) summarized the evidence for Paleoindian occupation of the Colorado Front Range as follows. The few Clovis and Folsom projectile points found in the mountains might have been picked up and carried there by later people. In other words, there is no strong evidence that those early hunters actually ventured into the high mountains. The evidence is better for occupation after 10,500 to 10,000 B.P. Agate Basin, Hell Gap, Scottsbluff, Eden, Firstview, Kersey, and obliquely flaked lanceolate points are found in numbers that argue for the actual presence of Paleoindian people in the high country (Benedict 1992:357).

Benedict (1992:357) further stated, "With a single exception . . . all known high-altitude sites containing Agate Basin and Hell Gap projectile points are on passes or along east-west travel routes; there is no evidence that the makers of these point styles visited the alpine tundra for reasons other than travel." Conversely, sites with Scottsbluff, Eden, Firstview, Kersey, and obliquely flaked points are found throughout a wider area and are thought to represent seasonal hunting and gathering in the region.

During the period from 9500 to approximately 8000 B.P., two different contemporary groups might have used the mountain area (Frison 1992). One group was the Paleoindians of the Plains region as described in the sections above. These people focused on hunting bison and used high-quality cryptocrystalline stone for tool manufacture. These lithic materials were often from distant sources, suggesting that the people traveled widely and/or had trade contacts. These people appear to have made forays into the mountains, probably in search of game. The second group was more closely tied to the mountains. They made lanceolate, usually unstemmed, projectile points with parallel-oblique flaking, almost entirely from local sources of stone. Benedict finds this situation similar to what is known for the Arapahos and Utes in the early nineteenth century (Benedict 1992:357).

In addition to the two sites described below, Benedict (1992:348) mentions that obliquely flaked lanceolate points have been found near two game drive sites. The sites, 5GA56 and 5GA58, are on the Continental Divide south of Rollins Pass.

Caribou Lake Site (5GA22) (Benedict 1985)

The Caribou Lake site is located just west of the Continental Divide, and hence slightly outside the Platte River Basin. However, because Paleoindian sites in the mountains are rare, it is worth discussing briefly. Benedict (1985) described the Caribou Lake site as a stratified, multicomponent campsite, northwest of the Caribou Lake outlet. Benedict believed that the site was a stopping place along a prehistoric travel route between the South Platte and the Colorado River drainages. The area was strategically situated for east-west trade, and provided access to game drive systems near Arapaho Pass (Benedict 1985:166).

The first occupation of the site was by Paleoindians of the Cody complex. The Paleoindian component consisted of a hearth with a radiocarbon age of 8460 ± 140 B.P. A projectile point base that appeared to be of a type in the Cody complex was found along with flaked stone tools, utilized flakes, and a bifacial knife. Much of the stone was white chert or chalcedony from the Kremmling area in Middle Park (Benedict 1985).

Fourth of July Valley Site

At the Fourth of July Valley site, located just east of the Continental Divide, Benedict (1981) found a Jimmy Allen point, along with several Middle Archaic points and beaked gravers. Benedict recovered two radiocarbon samples, with the average of the two age determinations being 5960 ± 85 BP. Although the radiocarbon age would seem to argue for multiple components at the site, or perhaps for reuse of the Paleoindian point by Archaic people, Benedict (1992) interpreted the site as representing a single component. He saw the component as a transition between Paleoindian and Archaic complexes (Cassells 1997). According to Benedict (1992:356), "Most archaeologists would agree that the projectile points and beaked gravers have a strong Paleoindian

character. But comparable artifact styles ceased to be used on the High Plains and in the central Rocky Mountain foothills by 7,500 B.P. Their occurrence at the Fourth of July Valley site about 6,000 B.P. suggests that people with a Paleoindian lithic technology continued to occupy the high mountains for 1,500 years after their disappearance from lower elevations." The site might represent a high-altitude refuge and extension of the Paleoindian tradition brought about by drought at the lower elevations (Cassells 1997:87).

Site 5BL70

The excavator of this site, Byron Olson, categorized it as a campsite where hunting tools were repaired and tools of flaked stone were manufactured. There was also evidence that sandstone slabs and handstones were used for grinding and crushing materials such as seeds. The site was located on the southeast-facing slope of Albion Ridge near the headwaters of North Boulder Creek. The site appeared to date primarily to the Early Archaic period. According to Benedict (1992:353), however, there was slight evidence of a Paleoindian occupation. The evidence consisted of a radiocarbon date of 7650 ± 190 B.P., a fragment of a projectile point that might have been Paleoindian, and a flake scraper.

Other Plano Period Remains

Gordon Creek Burial (5LR99) (Breternitz et al.1971)

The Gordon Creek Burial was a human burial eroding from the side of an arroyo along Gordon Creek, northwest of Fort Collins. The skeletal materials were stained with hematite and appeared to have been in a flexed position with the head to the north. A radiocarbon collagen fraction date of 9700 ± 250 B.P. was obtained from a sample of the bone (Anderson 1966). The person buried in the grave was identified as a 26- to 30-year-old female, approximately 4 feet 11 inches tall (Breternitz et al. 1971). Artifacts found with the burial included three bifaces, a polished stone, a hammerstone, an end scraper, several utilized flakes, two cut animal ribs covered with hemetite, and four elk incisors — one of which had been perforated at the tip. The other three elk teeth were missing their roots, so it is not known if they had been perforated (Gleichman and Gleichman 1989:33).

Interpretation

As with the hunters of the Folsom period, people's lives during the Plano period appear to have revolved around the hunting, killing, and processing of bison. The data for the Plano period allow a brief reconstruction of their way of life. Plano hunters and their families had to carry their belongings with them, including dwellings, supplies, and weapons, in their pursuit of game. Little is known about the types of shelters constructed by Plano people, but Frison (1992) reported that post molds that may have outlined structures were found at the Hell Gap site.

Frison's work at the Casper site in Wyoming showed that the hunters used a parabolic sand dune with steep sides to trap a herd of approximately 100 bison. The animals were driven into the loose sand, where their hoofs bogged down (Frison 1974). As they became trapped, the hunters moved in to dispatch them with spears equipped with stone points. Frison found 81 Hell Gap points or point fragments at the site. Experiments with replicas of these points hafted to

spears showed that they could penetrate the hide and rib cage of an ox carcass (Fagan 1987) and therefore would have worked against a bison as well.

Frison and Stanford (1982) found that a somewhat different method had been used at the Agate Basin site in Wyoming. There, the Plano hunters herded small groups of bison into the shallow part of an arroyo and then chased them upstream to where the sides were steeper and the animals could be trapped and killed. Some of the butchering was done where the animals were killed and some was done in processing areas nearby. Deep arroyos were also used to kill large numbers of bison, such as at Olsen-Chubbuck, described above. Such large kills were probably infrequent, but smaller kills were no doubt more common and may have taken place every year or several times in a year. This was apparently the case on the Southern High Plains during the Plano period, where many small kill sites have been found (Bamforth 1985).

Little is also known of the daily lives of people in the Plano period. Analogy with historic Plains societies suggests that men did the hunting, but this is unproven prehistorically. Perhaps men and women shared equally in the duties of hunting and of butchering the animals. It is also likely that smaller animals and wild plants contributed something to the diet of people during the Plano, and earlier periods, even though evidence is scant. Again, analogy would suggest that women did the gathering while men hunted.

THEORETICAL CONSIDERATIONS

Research Topics

The following section addresses the research topics presented in Chapter 3. The individual authors in this context were free to address as many or all of the topics as they wished.

Settlement Patterns

Although Colorado has a large number of important Paleoindian sites, the number of sites for any given period in the Paleoindian stage in the Platte River Basin is small. For this reason, discussion of settlement patterns is general. For example, the site distribution maps in this chapter reveal that evidence for the Clovis period is limited to the plains portion of the Platte River Basin, although isolated Clovis points have been found at higher elevations. There is more evidence for Folsom use of the foothills and mountains as indicated by the distribution map, but the majority of Folsom sites are on the plains. During the Plano period, especially late, there was increased use of the mountains. Information from site reports shows that river terraces were favored by Paleoindians during all periods, although some sites appear to have been situated in sand dune locations. Late Paleoindian sites in the mountains are often located in passes.

Paleodemography

The topic of paleodemography is addressed below in the discussion of research problems from the earlier context reports (Eighmy 1984; Guthrie et al 1984). The pertinent research problem concerns demography and the transition to the Archaic.

Subsistence

This research topic is also addressed below in the discussions of research problems from the 1984 context reports.

Trade and Exchange

The topic of trade and exchange among Paleoindian groups is briefly addressed in the research problems. Little can be said about exchange during the Paleoindian stage, except that Paleoindians had access, either through direct procurement or exchange, to widely dispersed lithic sources.

Chronology

A discussion of chronology for the Paleoindian stage is incorporated below. The specific research problem is that concerned with the ages, duration, and contemporaneity of Paleoindian periods.

Research Problems

Eighmy (1984:47) identified 12 research problems in his context report on the prehistory of the Colorado plains. Those research problems are listed below along with brief discussions of each, including any information obtained since the writing of the previous context report. Likewise, Guthrie et al. (1984) discussed several research "domains," and those are incorporated into the following discussion. Many of these have been addressed in the Multiple Properties Documentation by Gleichman and Gleichman (1989).

- Site function.

Knowledge of site types and site function for the Paleoindian period has changed little since the publication of *Colorado Plains Prehistoric Context* (Eighmy 1984) and *Colorado Mountains Prehistoric Context* (Guthrie et al. 1984). As discussed above, the Paleoindian site types identified through excavation are mainly limited to campsites, kill sites, and animal processing sites, with their corresponding functions. However, archaeologists should recognize that for band-level societies whose subsistence was based primarily on hunting large game, more variety and complexity of site types should probably not be expected.

Campsites include the Folsom Lindenmeier site and Plano sites such as Claypool and Jurgens. Activities at campsites appear to have involved the preparation and consumption of food, production and maintenance of tools, and no doubt biological and social activities that left little or no evidence in the archaeological record.

Other sites, or features, include caches, represented by the Drake Clovis Cache where hunters had stored several finished projectile points for later use. Caches may have been widespread — a Clovis-age cache containing 13 bifaces was found in northwestern Kansas (Hofman 1995), for example — but because of their isolated nature and small size, few have been found. Another site, the Gorden Creek Burial, was a human burial that has been dated to the Plano period. This site represents an activity that must have occurred many times throughout the

millennia, but the physical remains of which are isolated and rarely found. The question of site function can really only be addressed with additional, careful excavation of Paleoindian sites and detailed analysis to determine the nature of activities that once took place at those sites.

- Demography and the transition to the Archaic.

Because there has been little work on Paleoindian sites in the Platte River Basin since 1984, little can be added to a discussion of demography for the period. Perusal of the database indicates that the number of sites in the region ranges from six sites in the Clovis period (including the Drake Cache), to 21 sites for the Folsom period, up to 41 sites for the Plano period. One should, however, take into consideration that older sites were perhaps subject to deeper burial and suffered longer from the destructive forces of nature and time, and thus are probably less likely to be found. Nevertheless, the increase in numbers of sites through time fits the general conception of an increase in population, as time passed, for groups moving into the unoccupied niche of the Platte River Basin.

This research topic can be periodically readdressed, at a general level, with continued archaeological survey and use of the OAHP database. More detailed demographic data might be obtained through additional excavation of Paleoindian sites of all types.

- The taxonomic status of Paleoindian complexes such as the Cody, Kersey, and Firstview complexes.

Little has been done to resolve the questions surrounding the status of the Cody, Kersey, and Firstview complexes, and the relationships among them, since the excavations of the sites discussed above. Visual examination of illustrations and photographs of Kersey projectile points indicates that they are similar to the Eden points of the Cody complex, and the knives of the Kersey complex appear to be much like Scottsbluff points. Thus, at that very cursory level of investigation, it appears that the Kersey complex is an unnecessary construct and that the Jurgens site can be assigned to the Cody complex. However, as stated above, Joe Ben Wheat was a careful and thorough investigator, and he identified what he believed were manufacturing differences between Eden and Kersey points. Support is added to Wheat's position by the absence of Cody knives from the assemblage at Jurgens. Although the absence of something is not strong support, it does suggest the possibility of differences among the complexes.

Many archaeologists, however, are not convinced that the complexes are different enough to be formally separated. Cassells (1997), for example, includes Kersey and Firstview in the Cody complex. Fulgham and Stanford (1982) recovered projectile points from the Frasca site that were identical to points from Jurgens. They stated that diachronic or synchronic "divergence" had not been demonstrated between the cultures from Jurgens and Frasca and the classic Cody complex in the Northern Plains. Therefore, they retained the term "Cody complex" and assigned the materials from Frasca and Jurgens to that complex (Fulgham and Stanford 1982:9). Bamforth (1991:315-316) also categorized Firstview, Kersey, Eden, Scottsbluff, and Alberta points as all belonging to the Cody complex, as follows.

> Many of the differences on which typological distinctions among Cody point types rely are in "minor" typological features: Firstview and Kersey points, for example, are stemmed by grinding rather than by flaking, and other types are distinguished primarily by differences

in the width and depth of the last round of pressure flaking represented. Similarly, differences in the degree of stemming of Cody points, such as those recently emphasized by Ebell (1988), may result from the individual preferences of different stoneworkers or simply from the need to haft a standardized set of shafts made by someone else. In addition, many types are also found only or primarily at one site (i.e., Kersey points), and virtually all of the sites which have been studied are communal kills.

Bamforth (1991) also suggested that raw material may have played a role in determining some of the characteristics of different point types. For example, Eden points at the Horner site showed a tendency to be made from a certain type of high-quality chert.

In his context report, Eighmy (1984:45) stated that, "At present, independent dating is too inaccurate to be definitive in working out these problems, and stratified Plano Period sites are unknown for eastern Colorado." Unfortunately, the situation has not changed. Dating of the Plano sites has not been refined, and no new excavation of Paleoindian sites on the plains of the Platte River Basin has taken place.

This problem could be attacked with new data on two fronts: 1) a thorough restudy of the lithic assemblages from Jurgens, Olsen-Chubbuck, and several Cody complex sites could be undertaken, and 2) excavation of additional Plano sites could help resolve the problem. To date, Jurgens and Olsen-Chubbuck are the only examples of the Kersey and Firstview complexes, respectively. Other sites and assemblages that fit the patterns of Kersey and Firstview would greatly strengthen the position that they are separate and distinct. The absence of such sites and the addition of newly investigated sites to the Cody complex would strengthen the argument for one overarching complex and leave the concepts of Kersey and Firstview as anomalous and unsupported.

- The ages, duration, and contemporaneity of Paleoindian taxa.

Radiocarbon ages place the Clovis occupation of the New World at between 11,200 and 10,900 B.P. (Frison 1993; Haynes 1992). In the Platte River Basin, a radiocarbon age of 11,200 ± 500 B.P. was obtained from the Dent site (OAHP radiocarbon database). Another radiocarbon age of 7200 ± 200 for Dent is considered to be inaccurate (Haynes 1964).

The Folsom period dates between 10,900 and 10,200 B.P. (Frison 1993; Haynes 1992). One date in the OAHP database from Lindenmeier, 10,780 ± 135 B.P., falls within that range. But six others (11,200 ± 400, 5020 ± 300, 5020 ± 300, 5280 ± 80, 8400 ± 500, and 960 ± 180 B.P.) do not. However, Haynes et al. (1992:89) provide two other dates from Lindenmeier that also fall within the Folsom time range: 10,560 ± 110 B.P. and 10,500 ± 80 B.P. In addition, they list radiocarbon dates from other Folsom sites that confirm the 10,900 to 10,200 B.P. time range.

As Frison stated, the temporal ranges for Clovis and Folsom leave very little room for the Goshen complex, and "the possibility that Goshen is an early Folsom variant or something contemporaneous with Clovis must now be considered" (Frison 1993:12). Obviously, more research needs to be conducted on so-called Goshen components to determine the validity of the complex and where it fits temporally.

Because of the diversity evident during the Plano period, dating of the various complexes is somewhat complicated. Radiocarbon ages from the Agate Basin site for both the Agate Basin and Hell Gap complexes are around 10,500 B.P., indicating an overlap with the Folsom period (Frison 1993; Frison and Stanford 1982) and suggesting that those two complexes were early in the Plano period. This is supported by the age of 10,020 ± 320 B.P. for Jones-Miller, a Hell Gap site. A somewhat more recent date of 9600 ± 130 B.P. came from the Agate Basin site, Frazier.

A radiocarbon age of 8910 ± 90 B.P. was obtained for the Frasca site, assignable to the Cody complex. Another Cody complex site, Nelson, produced a radiocarbon age of 7995 ± 80 B.P. This placed the Cody complex at between 9000 and approximately 8000 B.P., occurring after the Agate Basin and Hell Gap complexes in the Paleoindian chronology. Wheat (1979) obtained a radiocarbon age of 9070 ± 90 B.P. for a sample from Jurgens, placing it near the Cody complex range. Firstview dates between 10,000 and 8000 B.P., again perhaps placing it in or near the temporal range of the Cody complex (Bamforth 1991).

- The relationship between environmental and cultural change, especially during transitional periods like the end of the Plano.

Again, there has been little study of this topic since the last context reports. Changes in the environment, and especially the climate, appear to correlate with some of the major changes during the Paleoindian stage. Evidence suggests a correlation between the disappearance of Clovis hunters and disappearance of the mammoth, and a warming and drying trend in the late Pleistocene (Eighmy 1984). In his well-known theory of Pleistocene extinction, Martin (1958, 1973) suggested that humans caused the demise of the mammoth, mastodon, and other megafauna. The timing of the extinctions and the end of the Clovis period seemed to many researchers to indicate a valid connection (Hester 1960). However, others believe that it was the warming of the climate that caused the disappearance of the mammoth, and that the descendants of the Clovis hunters adopted the bison-hunting pattern evident with the Folsom period.

It appears that drought conditions of the Altithermal affected human and animal populations on the plains (Frison 1991a:79). According to Frison (1991a), evidence from this period may be difficult to find because it was either removed or has been obscured by extreme conditions of erosion and deposition. Nevertheless, the dry conditions may have affected the ability of the prehistoric hunters to function on the plains and to pursue a big game hunting way of life, pushing them to find more suitable homes in the foothills and mountain regions.

- The existence of late Plano complexes such as the Lusk, Fredrick, and Jimmy Allen, which are known from surrounding areas.

The existence of terminal Paleoindian complexes is a question that remains unresolved (Frison 1993). New information since the production of the 1984 context reports (Eighmy 1984; Guthrie et al. 1984) or the multiple properties listing (Gleichman and Gleichman 1989) has not been found to help address the issue for the Platte River Basin. The late Paleoindian complexes include Angostura, Frederick, Meserve, Pryor Stemmed, Lusk, and Frontier. They all appear to date between 8500 B.P. and 7500 B.P. The complexes are characterized by parallel-obliquely flaked projectile points. According to Robert Brunswig (personal communication 1999), the Angostura and stemmed point complexes are essentially mountain Paleoindian but do occasionally intrude onto the plains. Gleichman and Gleichman (1989:26) stated, "No sites in Colorado have

been definitely identified representing the late complexes." This research topic can be addressed only with additional survey and excavation and careful analysis of late Paleoindian sites.

- Seasonality of habitation and/or kill site occupation and the question of site function.

Communal Paleoindian bison kills in the plains and intermontane basins appear to have taken place most often in the winter or late fall. There is also evidence that the Paleoindians used short-term caches to store surplus meat (see Frison 1982). Large, frozen-meat caches may have been used to store the meat from mass kills. This would probably have forced hunting groups to camp nearby to avoid having to carry the supplies too far and to protect the meat from scavengers (Frison 1992:331).

The evidence for communal hunting taking place in the cold months comes from sites such as Jones-Miller, where bison were completely butchered suggests that the weather was cold enough to prevent spoilage (Stanford 1975). At the Carter/Kerr-McGee site, the kill appears to have taken place in the early winter based on the tooth eruption evidence from subadult bison (Frison 1984). Other examples include the Casper site, where the kill occurred in late autumn (Frison 1974), and the Agate Basin kill, which probably occurred in late February or early March, again based on tooth eruption evidence (Frison and Stanford 1982). It is probable, as has been suggested by Saunders and Penman (1979), that the majority of bison kills, especially the mass kills, were conducted in the late fall or early winter to procure meat for storage and consumption throughout the winter months.

- The taxonomic/temporal relationship between fluted and similar unfluted points.

Projectile points from the Goshen complex appear to represent an unfluted version of the Folsom point, and radiocarbon dates from such sites as Mill Iron (Frison 1993:8-9) suggest a date range between the Clovis and Folsom periods. Both Folsom and Goshen points have been found at sites in Middle Park (Naze 1986). The evidence to date suggests that Goshen points may have been the precursors to Folsom points. The relationship between these two types of points remains a problem for further research in the Platte River Basin.

Frison (1993:12) believed that there is little evidence for the existence of a Midland complex separate from either Folsom or Goshen. The examples of projectile points from Hell Gap that were assigned to the Midland complex by (Irwin-Williams et al. 1973) could fit into the unfluted Folsom category or into the Goshen point category (Frison 1993).

- Lithic source identification, utilization, and distribution.

Identification of lithic sources for Paleoindian groups in the Platte River Basin has been incomplete, owing in part to the time that much of the original work was done. Synthesis is needed on the order of that done for Clovis projectile points in Kansas by Hofman and Hesse (1996), and for Folsom points in Kansas by Hofman (1994). Hofman and Hesse (1996:24) identified Kansas Clovis points as having been manufactured from Flattop chalcedony (northeastern Colorado), Niobrara jasper (northwestern Kansas and southwestern Nebraska), Alibates dolomite (Texas panhandle), and quartzites that probably came from southeastern Colorado and southwestern Kansas. It is very likely that many of the specimens from the Platte

River Basin of Colorado were from those same sources. For example, Stanford and Jodry (1988) identified the majority of points in the Drake Cache as having been made of Alibates dolomite.

- Subsistence and extent of gathering in Paleoindian subsistence.

Frison (1992:333) stated that plant foods were probably an important part of the foothill-mountain subsistence for the late Paleoindians. He lists seeds, berries, roots, leaves, and bulbs as having been found at Paleoindian sites. Those included sunflower (*Helianthus annuus*), prickly pear (*Opuntia polyacantha*), amaranth (*Amaranthus retroflexus*), and limber pine (*Pinus flexilis*). Frison's data are from Wyoming, but it is likely that similar plants were gathered by the inhabitants of the Platte River Basin. Pollen analysis at the Jurgens site, however, appears to have been more indicative of what was growing in the environment of the site than what might have been utilized by the inhabitants (Scott 1979:149). This research topic remains one of the most important for our understanding of Paleoindian lifeways. Careful excavation and recovery efforts at sites in the basin might provide pollen and macrobotanical evidence of the gathering of plant resources by Paleoindian groups. In addition, efforts should be made to address the question of whether smaller game was also hunted.

- Formation processes of Paleoindian sites, the rate of site destruction, and nature of site transformation. Were geomorphological conditions favorable for the preservation of Paleoindian sites in the mountains?

The paucity of excavations at Paleoindian sites since 1984 means that no new data can be applied to addressing this research topic. Careful excavation and geomorphological studies of Paleoindian sites would be needed to make further, significant headway on this topic. Evidence for Paleoindian occupation of the mountains is very limited. Geomorphological studies are needed to determine the potential for preservation of Paleoindian sites in that environment, and to assess whether that is due to limited use of the region by Paleoindians, or lack of preservation of those early remains.

- The nature of any pre-Clovis occupation.

The evidence for a pre-Clovis occupation in the Platte River Basin is basically nonexistent. Although some of the bone recovered from Selby, Dutton, and Lamb Springs appeared to have been broken and polished by human hands, the evidence was equivocal. In fact, many of the scholars involved in the inquiry, such as Dennis Stanford (1983:72), believe that data are inadequate to support the pre-Clovis concept, but do see enough evidence to be encouraged to continue the search. New evidence from sites in the Platte River Basin would represent a major contribution in further addressing this research question.

- The extent of utilization of the mountain region by the Paleoindian.

As discussed above, Frison (1992) has argued for the existence of a Foothills/Mountain complex in the late Paleoindian period. As opposed to the hunting of large game on the plains, the Foothills/Mountain Paleoindians hunted smaller game in the cooler, moister high country. They also foraged for plant resources to a greater degree than groups on the plains. Much of our information on Paleoindian occupation of the high country comes from the work of James

Benedict (e.g., Benedict 1992). Additional research can help to shed light on the nature of the Paleoindian occupation of the mountainous portion of the Platte River Basin.

Additional Research Problems

The research problems discussed above remain topics of concern in the prehistory of the Platte River Basin. None of those problems has been completely solved, and, therefore, each can be carried forward into research in the Platte River Basin. Topics such as the continued examination of the pre-Clovis issue and the subsistence mix for various Paleoindian periods along with the role of gathering as a supplement to hunted foods will remain questions of great interest to researchers in the region. In addition to the research problems listed in the 1984 context reports, the following can be added and, it is hoped, addressed with future work:

- The validity of the Mountain/Foothills Complex
- The nature and validity of the Goshen complex.
- Refinement of Paleoindian chronology in the Platte River Basin.
- Gender roles in prehistoric Plains societies in the Platte River Basin.
- The types of shelters utilized during the different Paleoindian periods.
- Paleoindian social organization.
- Ritual and belief during the Paleoindian stage.
- The possible role of humans in extinctions of megafauna.

Chapter 5

ARCHAIC STAGE

Marcia J. Tate

INTRODUCTION

Almost 20 years ago, Greiser (1980) observed that the Early Archaic is the ".... least known period of the High Plains." Butler (1990:18) has expanded on Greiser's earlier statement to include the entire stage noting that, "our understanding of the Archaic periods is especially poor. The Early Archaic occupations are best known from the mountains, whereas the Middle Archaic is best known on the Plains; the Late Archaic is poorly understood everywhere in Eastern Colorado." Cassells (1997:116), too, finds the Archaic enigmatic, observing that, "of all the work to be done in Colorado by future generations of archaeologists, delineating the Archaic of the mountains and plains will probably be the most challenging." He cautions that thus far, chronologies and artifact sequences are based on data from excavated sites concentrated in a region centered on the hogback valley west of Denver and high country sites in the Indian Peaks Wilderness Area west of Boulder, and that geologic processes and pothunting at these sites have often resulted in mixed strata. He has further noted that a comparison of projectile point types is difficult because of the lack of a uniform system for describing them and that it is not possible to compare artifacts from the necessary broad range of locations because of the general lack of excavated sites on the plains.

The knowledge gleaned during the past several decades of archaeological work, however, has provided some information with which to characterize this little known cultural manifestation. The Archaic stage can be described as a time of changing environment that necessitated modifications of the lifestyle of the preceding Paleoindian stage which resulted in a markedly different adaptation. Pleistocene fauna had been replaced by modern Holocene species and aboriginal people had broadened their resource base by exploiting both the larger traditional game animals and smaller animals, and by increasing their emphasis on plant resources. This represents a shift in emphasis from specialized big game hunting to a more diversified subsistence pattern (Guthrie et al. 1984). However, it is likely that this was no more than a fluctuation in a relatively stable and flexible economic system. Climatic fluctuation and environmental variables contributed to a varying subsistence adaptation (Michlovic 1986). Frison (1975) postulated two major economic patterns on the Northwestern Plains by the end of the Paleoindian stage: hunting of bison in open areas, such as the plains, and intensive hunting of smaller game and gathering of plants in the foothills and mountains. The likely reduction in bison or their absence on the plains during the Altithermal probably contributed to an expansion in intensive foraging as hunting was curtailed. In post-Altithermal times, bison, the preferred food for peoples on the Great Plains throughout prehistory, became more readily available (Michlovic 1986). Butler (1997a, 1992) suggests, however, that although bison were present in eastern Colorado during the remainder of the Archaic, there may not have been high numbers, as his analysis indicates that the preference on the plains (and in the hogbacks/foothills) was for deer, and at times even rabbit, over bison. Not until sometime in the Late Prehistoric stage did the number of bison increase to the point where they could once again dominate economic strategies. Technological adaptations of the Archaic stage included a diversification of the tool kit, expansion of the ground stone assemblage, and a

general decrease in the size of projectile points (Anderson et al. 1994), now characterized by both stemmed and notched types. Also of importance are stone boiling firepits, storage cists, and architectural features (Black 1995).

Several models have been proposed as explanations of Archaic occupation on the High Plains and in the Rocky Mountains. Those most relevant to the Platte River drainage basin in northeastern Colorado are: the mountain refugium model advanced by Benedict (Benedict and Olson 1978; Benedict 1979a) to explain settlement patterns in the mountains and surrounding areas during the Early Archaic period; the grand circuit model, also offered by Benedict (1990) to illustrate a pattern of seasonal use of the mountains by hogbacks/foothills-based groups throughout the Archaic; and the Mountain tradition posited by Black (Black 1991; Metcalf and Black 1988, 1991) to explain year-round occupation by indigenous peoples in the Southern Rocky Mountains from the end of the Paleoindian period extending into the Late Prehistoric era.

Mountain Refugium

Based upon erosional and depositional cycles seen in geological strata, Antevs (1948:76) proposed that former environments of the American West be divided into three climatic episodes: the Anathermal (19,150-7500 B.P.), a time of cooler and wetter climatic conditions than present; the Altithermal (7500-4000 B.P., an episode characterized by warmer and drier climate than present; and the Medithermal (4000 B.P. to present), a period of climatic amelioration with increasing moisture and decreasing temperatures until the relative stability of the present was reached. The dates used here result from a later revision of the scheme (Antevs 1955:328).

In response to Antevs' (1948, 1955) model with its Altithermal climatic episode and the subsequent correlative climatic model of Bryson et al. (1970)(see Chapter 2), archaeologists have attempted to interpret the observed relative sparsity of Early Archaic sites on the plains as a result of the effects of the climatic manifestation. The theories, which have developed and evolved over several decades, posit a cultural hiatus on the plains (e.g., Mulloy 1954, 1958), generally with use of mountain or ecotonal refugia (Wedel 1961; Hurt 1966; Benedict and Olson 1978; Benedict 1979a; Buchner 1980, and others) and a non-hiatus (Reeves 1973). Pertinent to study of the Platte River drainage area is the mountain refugium model (Benedict and Olson 1978; Benedict 1979a).

In the Continental Divide region of the Colorado Front Range, James Benedict has for several decades conducted intensive research at several sites, many of which have been dated to the Altithermal. From this information, Benedict has hypothesized a mountain refugium model to explain the area's Early Archaic archaeological record. According to this model, foraging hunter-gatherers abandoned the drought-affected plains and western plateaus, seeking refuge in the relatively cool and moist Rocky Mountains. Benedict gathered totals of radiocarbon-derived dates from acknowledged Altithermal sites across a large area of western North America to derive population curves. From these data, he has argued that rather than a single great drought, there were actually two major Altithermal droughts, from 7000 to 6500 B.P. and 6000 to 5500 B.P., which were separated by a period of increasing moisture and local mountain glaciation. This interval brought sufficient relief to allow successful reoccupation of the mountains' adjoining areas, including the plains. In the Continental Divide area of the Front Range, Benedict and Olson (1978) defined the Mount Albion complex, postulating seasonal use of the high country during the Altithermal by people who were based in the hogbacks/foothills to the east.

Access to and from the Continental Divide area was explained by a simple up-and-down or piston engine model. The former involved seasonal movements from base camps at low elevations to summer hunting camps along the Continental Divide. Here, they participated in communal hunts, moving from drive system to drive system, and gathered wild plant foods, returning to their winter base camps in the fall (Benedict and Olson 1978; Benedict 1979a). Benedict (1990) finds that while the winter base camps of some of these prehistoric groups may have been west of the mountains, the hogback region and river bottoms to the east provided a much milder winter environment and were likely favored. A second, more complex transhumance system, the rotary engine model, is discussed below.

The Grand Circuit

The grand circuit model describes seasonal movements of cultural groups during the latter portion of the Early Archaic into Early Ceramic times. These groups, who were based at relatively lower elevations east of the Continental Divide participated in a complex seasonal round of visits to both the east and west slopes of the Front Range, as well as its high country. As described, groups based at winter camps along the eastern flank of the Front Range followed a rotary engine transhumance pattern, traveling north in early spring along the front of the mountains into the Laramie Basin, then crossing a low point in the crest of the Medicine Bows into North Park, where plant resources were available and large game, including bison, and waterfowl were abundant. Next, the groups moved south across Muddy Pass into Middle Park, which was also rich in game. By late summer, these groups began moving east toward the high country of the Continental Divide where they camped near game drives in preparation of communal hunting of large game, particularly bighorn sheep (Benedict 1990:68-71).

Mountain Tradition

Black (1991) has noted that the Paleoindian-Archaic transition on the High Plains was relatively undramatic, in that cultural continuity is reflected in the continued focus on bison hunting. In the Rocky Mountains, though, some late Paleoindian-Early Archaic sites have structures and artifact assemblages that are not characteristic of plains complexes of the same period. These sites have distributions limited to upland areas and Black (1991) believes that their lithic technologies may be derived from the Western Pluvial Lakes or Stemmed Point tradition of the Great Basin and that subsequent cultural continuity in high altitude areas has led to a unique Archaic adaptation, which he has termed the Mountain tradition. The tradition is represented in the archaeological record of the Southern Rockies until 1000-700 B.P., when Numic sites appear.

Six or more characteristics define the Mountain tradition. The defining criteria include settlement systems focusing on upland environments year-round, with winter habitations, as well as short-term dwelling structures. Stone tool technology typically includes use of a split-cobble core reduction strategy and split-cobble tools, especially in late Paleoindian and Early Archaic times. Additionally, there is the presence of microtools as distinct from microblades, particularly after 6000 B.P. Diverse projectile point styles with similarities to Great Basin types are also characteristic of the tradition. Finally, distinctive rock art with similarities to Great Basin styles is noted (Black 1991:4). Although the rock art is an uncommon resource in the Platte River Basin, discussions of projectile points and dwelling structures are relevant. Metcalf and Black (1997) have developed a model based on the forager-collector continuum of Binford (1980) to explain a

primarily logistical seasonal organization strategy proposed for the year-round mountain settlement pattern

Also pertinent to the Platte River study area is a hypothesis of technological change or evolution, in which the origin of McKean points is traced to the mountains, where a transition from Plano period projectile points is posited to have occurred during the Altithermal (Benedict and Olson 1973; Benedict 1981; see also Frison 1973).

CHRONOLOGY AND TAXONOMY

Stage definitions are generally based on both time and a dominant pattern of economic existence (Eighmy 1984). However, the cultural distinctions defining stages and their subdivisions, periods, most often employed are based on technology rather than dominant economic patterns, because hunting and gathering was the dominant pattern of economic existence crossing stage boundaries in northeastern Colorado. The archaeological record as currently known, however, indicates that a demonstrable change in economic and technological adaptations had occurred in the Platte River drainage basin as early as about 7500 B.P. Known as the Archaic stage, the technological adaptation and lifeway that the stage represents was present until about 1800 B.P. (A.D. 150). Defining the temporal boundaries of the stage over a wide geographic area such as the Platte River Basin requires an inclusive approach, because there is considerable variability in the record concerning beginning and ending dates for the stage and individual periods, and also some overlap, particularly with the subsequent Late Prehistoric stage.

Periods within stages are distinguished primarily by distinctive artifacts, hallmarks that reflect technological changes. Within the Archaic stage, the most distinctive period indicators have traditionally been projectile points that have been shown to occur within specific temporal ranges, those that are associated with radiocarbon ages from sites in the region. On the basis of the known archaeological record for the area (radiocarbon ages from site contexts with associated artifact types), three periods have been identified: Early Archaic (7500-5000 B.P.), Middle Archaic (5000-3000 B.P.), and Late Archaic (3000 B.P.-1800 B.P.).

Table 2 in the Appendix contains a list of radiocarbon age estimates and calibrated age ranges from Archaic sites in the Platte River study area. The basis for the present table was a comprehensive list of radiocarbon dates for the state, which was compiled by Angela Rayne (1997) and made available by the Office of Archaeology and Historic Preservation (OAHP) at the Colorado Historical Society (CHS). From Rayne's list, Archaic dates for the counties comprising the Platte River drainage basin were taken. These dates and ancillary data were than independently verified. As a result of this verification process, corrections were made in some instances. When data could not be verified, they were deleted. Finally additional age estimates and documentation were added. Although the occurrence of Altithermal climatic conditions in western North America put forth by Antevs (1955) is generally accepted, agreement about its effects on human populations on the Plains is lacking. Some argue that the plains were largely abandoned as noted above; others (e.g., Reeves 1973) believe that sampling bias and factors of erosion and deposition better explain the sparsity of sites of this period on the Plains. The Early Archaic period is characterized by a group of large, side- and corner-notched dart points (Figure 5-1), known in the Rocky Mountains and surrounding areas variously as Hawken, Bitterroot, Pahaska, and Simonsen, those described by Frison (1991a) as Altithermal side-notched, for

example; and also including local types such as Mount Albion (Benedict and Olson 1978) and MM 3 and MM 4 (shown in Figure 5-1), first defined at the Magic Mountain site (Irwin-Williams and Irwin 1966).

The Middle Archaic period is associated with gradually ameliorating climatic conditions following the Altithermal episode and possibly cooler and wetter conditions by the latter part of the period. There is an increase in the use of milling stones, generally seen as reflecting more intensive vegetal processing, and a change in projectile point technology from the Early Archaic. The lanceolate and stemmed, indented-base projectile points, Duncan and Hanna, of the McKean complex have traditionally been used as a hallmark of the period. Other points of the period include the side-notched Mallory and Yonkee as well as several side-notched forms that carry over from the preceding Early Archaic period, e.g., Hawken and the local MM 3 point. Side- and corner-notched points of the Elko series first make their appearance during this period and continue into the Late Archaic. It is likely that the stemmed Park point also dates to the Middle Archaic. There is a concentration of McKean sites or components in the eastern hogbacks and foothills, where cultural continuity from the Early Archaic period is also seen in the presence of MM 3 points, and sites on the plains are also more abundant than in the previous period.

The Late Archaic period is marked by continuity in the hunting and gathering subsistence strategy of previous periods. The period is generally characterized by a prevalence in large, corner-notched and side-notched dart points. In the mountains and hogbacks, particularly, these often have serrated blades. Point styles include the corner-notched Pelican Lake and the later Besant (see Figure 5-1), as well as several types defined from the Magic Mountain Apex complex, among others. While Cassells (1997:123) finds little else in the way of specific traits to distinguish the Late Archaic from the preceding Archaic periods, Black (1995) notes trends, such as predominance of rock-filled hearths and a decrease in permanent storage features, at least in the mountains and foothills. A high frequency of grinding tools with diverse floral remains and butchered bone and bone tools from a variety of species are also seen. The overall site frequency for the period is the highest of the Archaic stage (Figures 5-2 and 5-3).

In the interest of developing a useful taxonomy, Butler (1986) noted that there were no less than five taxonomies in use for northeastern Colorado, all with various problems. These include the schemes of Withers (1954) for the Late Prehistoric era, as well as more comprehensive constructs by Mulloy (1958), Wood (1967), and Eddy and Windmiller (1977). However, while these various systems were used in the literature of their time, they have not been in use recently. Instead the older systems were replaced by those of Guthrie et al. (1984) and Eighmy (1984), both of which divided the Archaic stage into the three periods identified above, and are generally comparable to the systems devised by Frison (1978) for the Northwest Plains and Cassells (1983) for northeast Colorado.

In a rigorous effort to create an expanded taxonomy to better describe similarities and differences in the record of culture content over time in northeastern Colorado, Butler (1986) developed a new taxonomy. His system was guided by the principles and methods of Willey and Phillips' (1958)

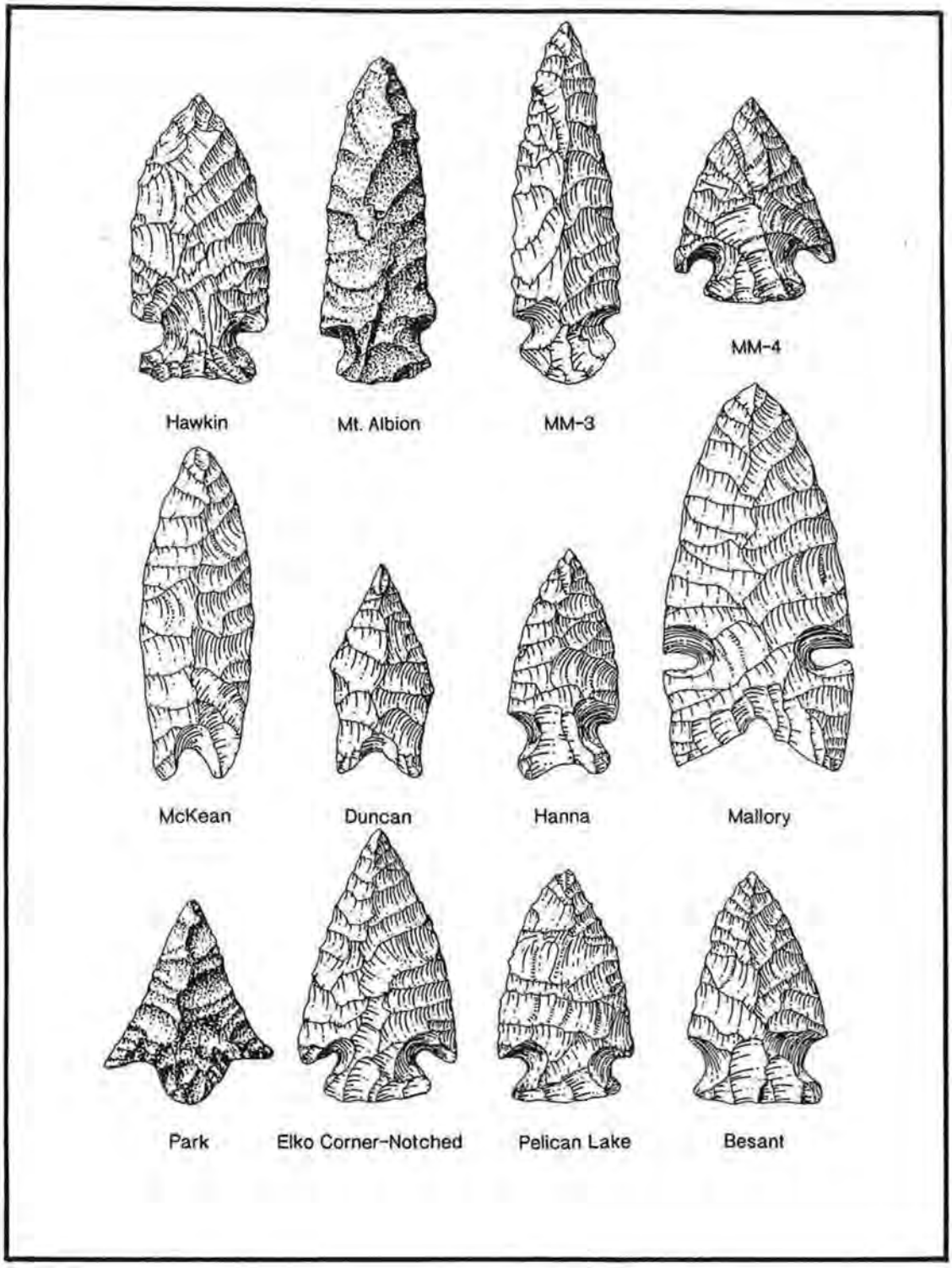

Figure 5-1. Archaic projectile points.

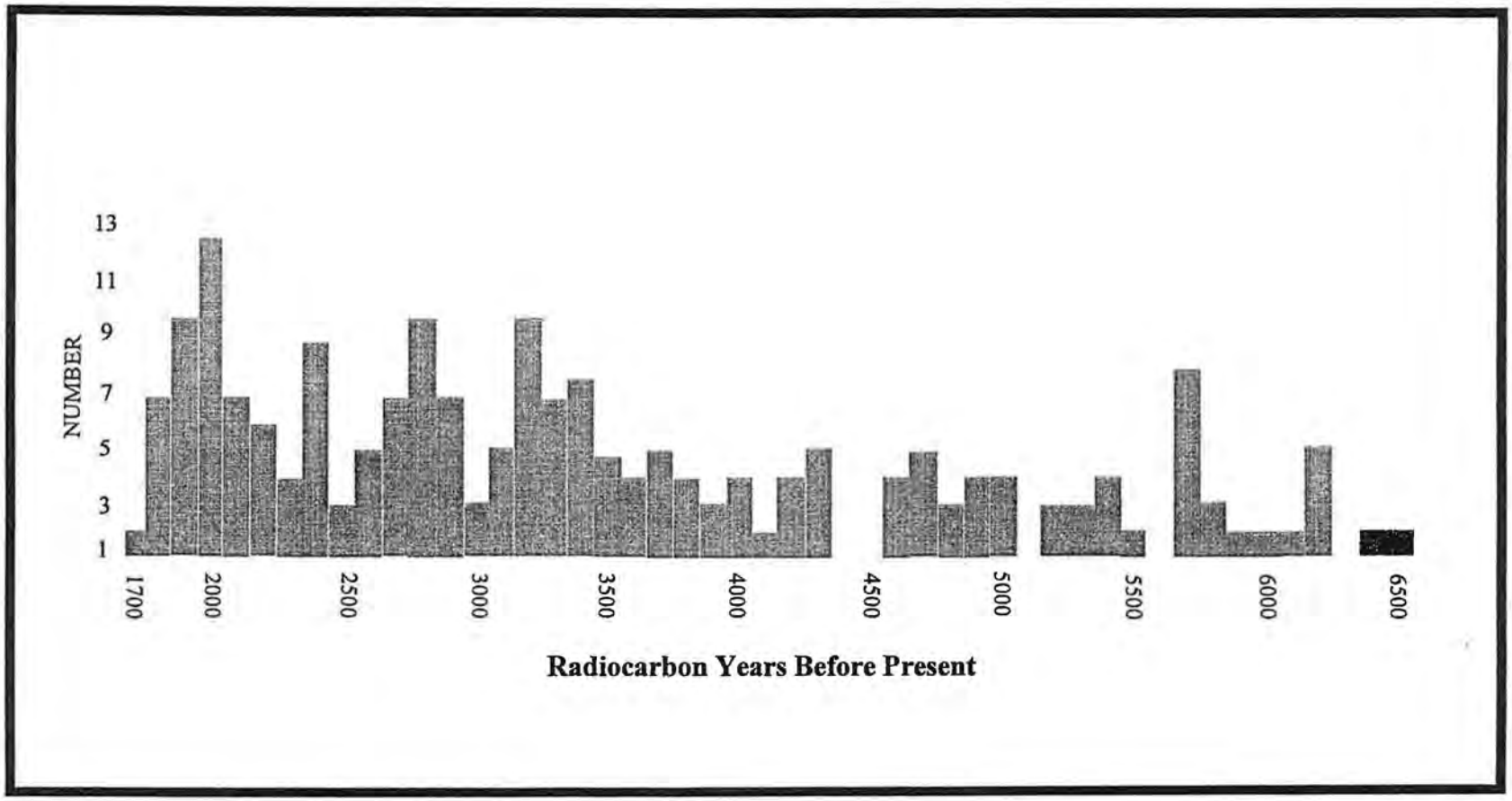

Figure 5-2. Frequencies of radiocarbon ages from sites in the Platte River basin.

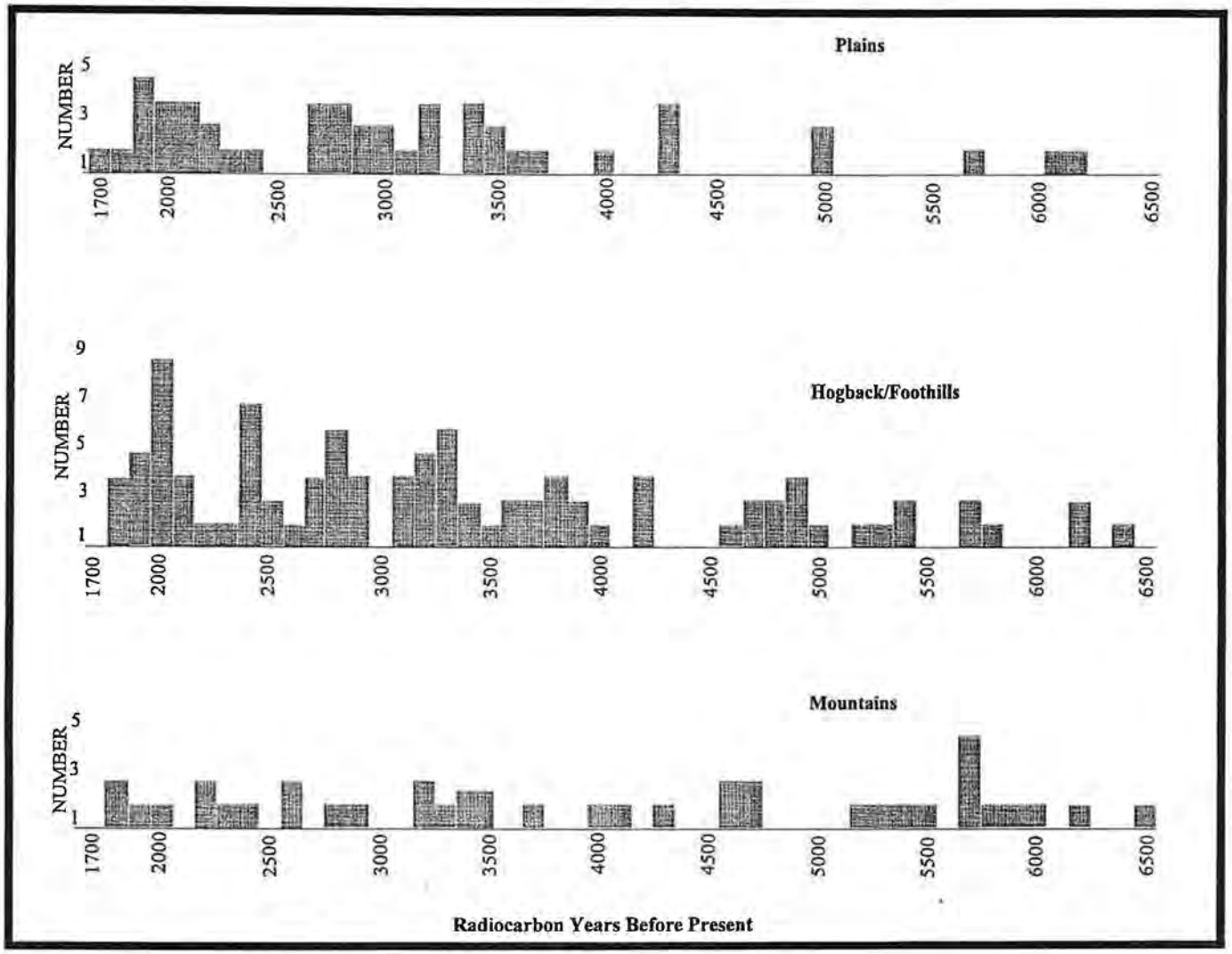

Figure 5-3. Frequencies of radiocarbon ages by subarea.

taxonomic system with Krause's (1977) clarification of Lehmer's (1971) regional variant modification. For the Archaic periods, this taxonomy begins with the Southern Rocky Mountain Early Archaic Regional Variant, based on the presence of Pryor Stemmed and James Allen points at sites, such as the Fourth of July Valley (Benedict 1981), that have been radiocarbon dated to the Early Archaic period. Next is the Western Plains Early Archaic Regional Variant category, which includes three phases, Albion Boardinghouse, Mount Albion, and Magic Mountain. This is followed by the Western Plains Middle and Late Archaic Regional Variant, which includes the Apex phase to describe Middle Archaic occupation and the Front Range phase for the Late Archaic period. At present, the data are most supportive of the Albion Boardinghouse and Mount Albion phases; while there are problems with the remainder, especially those based on the Magic Mountain database. Admittedly provisional, the system deserves recognition for its effort to organize the existing information into a logical and consistent fashion and should be tested by new information or study of existing collections, or both, in coming years.

SITE TYPES AND LOCATIONS

For management purposes, three basic levels of organization are designated in terms of cultural resources. These are district, site, and isolated find.

For prehistoric resources, a district can generally be described as a geographically definable area having a significant concentration, linkage, or continuity of sites united by past events. A district may also be defined to include individual elements separated geographically but linked by association or history (U.S. Department of the Interior [USDI] 1997). Of 13 designated archaeological districts of prehistoric sites listed in the National Register of Historic Places (NRHP), three are within the Platte River basin, one in Douglas County and two in Weld County. These districts are Roxborough State Park (5DA343), Keota Stone Circles (5WL662), and West Stoneham (5WL2180).

Once again, for prehistoric resources, a site is the location of a significant event, an occupation, activity, one or more buildings or structures (whether present or not), or a combination of these, whose location maintains archaeological value (USDI 1997). When a site meets federal or state criteria for significance, it is eligible for nomination to either the NRHP or State Register of Historic Properties (State Register). Within the Platte River basin, four prehistoric sites are listed in the NRHP and two sites listed in the State Register. The National Register sites include two known primarily for Paleoindian occupations, Lindenmeier (5LR13), which also has evidence of Archaic occupation, and Jurgens (5WL53). The other NRHP-listed sites, Magic Mountain (5JF223) and Bradford House III (5JF52), have significance that lies in Archaic and Early Ceramic occupations. The State Register sites include Lamb Spring (5DA83), which has evidence for occupations spanning the Paleoindian stage through the Early Ceramic period, and Rock Creek (5BL2312), with both evidence for occupations during the Archaic and Ceramic stage (CHS 1996).

A Profile of the Cultural Resources of Colorado compiled by OAHP lists 10 basic site types for the prehistoric era (CHS 1996) . Of these, nine are identified in the archaeological record for the Archaic stage in the Platte River drainage basin. The pertinent site types include open and sheltered lithic sites, open and sheltered camps, open and sheltered architectural sites, quarries, kill sites, game processing and butchering sites, ceremonial sites, burials, and rock art. The features of

the individual site types that are pertinent to Archaic occupation in the Platte River study area are described below.

Lithic sites contain flaked lithic materials, usually consisting of waste flakes and chipped stone tools. These sites can be in an open topographic situation or located in rockshelters, overhangs, or alcoves. Architecture is not present (CHS 1996). These are widespread in their distribution. Often, however, such sites are associated with nearby quarries and hunting overlooks.

Campsites consist of features or artifacts indicating domestic activity and are defined by the presence of one or more of the following artifact classes or features: ground stone, hearths, and middens. Additionally, waste flakes and chipped stone tools are usually present. Camps can be located in open topography or in rockshelters, overhangs, or alcoves. These sites do not contain architecture (CHS 1996). The highest concentration of known, dated Archaic camps in the study area is in the hogbacks/foothills area where both open and sheltered locations are present; however, the site type, often not absolute dated, is relatively common in all of the Platte's subareas and often found contain artifacts diagnostic of the Archaic stage. In the hogbacks/foothills, the camps are often multicomponent, sometimes well-stratified base camps. On the plains, there are open and occasionally sheltered camps. These include multicomponent sites, generally interpreted as seasonal base camps, and also short-term hunting camps or other resource procurement locations. There are also several short-term seasonal camps in the mountains, often associated with the high altitude game drives.

Architectural sites contain features descriptive of the term, which may include tipi rings, stone alignments, and pithouses. These sites, which may be situated in open topography or sheltered locations (CHS 1996), also include cairns, hunting blinds, and evidence for lean-to structures. Tipi rings are found in open topography, primarily in the plains and foothills, but also in the mountains, particularly in the parks. Most of the stone alignments in the Platte River study area are game drive lanes composed of either stone walls or a series of cairns and often associated with circular or semicircular, stone-walled hunting blinds. The vast majority of known game drive systems in the area are located along the Front Range crest above Middle Park. Here they are found along the Continental Divide where west-sloping remnants of the Tertiary erosional surface are cut by headwalls of Eastern Slope cirques, on ramps or benches, on narrow ridges extending eastward from grazing areas, on passes crossing the Continental Divide, and on floors of cols (saddles) that connect the heads of Eastern Slope valleys (Benedict 1992). Black (1990) described Archaic Period Architecture in Colorado in a Multiple Property Listing. Of four basic types (pithouses, surface mud-and-stick buildings, surface masonry buildings, and timber lodges), none are presently known for the Archaic stage in the Platte River study area. The nearest sites of these types are the Windy Gap sites (5GA151 and 5GA680), where evidence was found for possible architectural daub, dating from 7960 $\pm$ 140 B.P. to 3936 $\pm$ B.P. (Wheeler and Martin 1982, 1984). The only evidence for Archaic architecture aside from stone circles and features associated with game drives in the Platte River study area are a stone storage cist at Bradford House III, 5JF52, (Johnson and Lyons 1997b), postmolds of a probable lean-to placed in front of the Dancing Pants Shelter, 5DA29, (Liestman and Kranzush 1987), and a large rock wall at the Magic Mountain site, 5JF223, which was constructed at the time of the Late Archaic/Early Ceramic transition (Kalasz and Shields 1997).

Quarry sites include extraction locations for various materials that include lithic or building raw material, clay, and nonstone or nonclay raw material (CHS 1996). The vast majority

of these sites are lithic quarries, which are located where materials are exposed in outcrops or along ridge tops and slopes from which bedrock materials are eroding out. In the Platte River study area, these include outcrops of Dakota Sandstone, for example, where quartzite is exposed.

Kill sites contain primary evidence of the intentional slaughter, usually of multiple large animals. These sites are often associated with game processing/butchering sites. In the Platte River drainage basin, just one bison kill site is known, the highly disturbed Merino Site near the South Platte River in northeastern Colorado (Morris and Kainer 1975). At high altitude, evidence for kill episodes has been found in the vicinity of game drive sites.

Game Processing/Butchering sites contain the remnants of the larger segments of animals, typically large game, that are further reduced for consumption or transport. The remnant bones often contain butchering marks and associated cutting/chopping tools are often present (CHS 1996). These are assumed to be in the vicinity of kill sites. However, except for the high-altitude sites identified near game drives, the locations of kill sites inferred to be associated with the reported butchering sites are unknown. Butchering locales are known from sites such as Massey Draw (5JF339) and Dutch Creek (5JF463), found along the plains/mountains interface (Anderson et al. 1994; Jepson and Hand 1994). These particular sites are located in areas along water gaps that cross the hogbacks west of Denver, where animals may have been ambushed nearby along the stream course as they were attempting to enter or retreat from the hogback valleys.

Ceremonial sites are those with ceremonial significance, such as vision quest sites, and often contain ceremonial artifacts (CHS 1996) and stone features, such as fasting beds or cairns. A good example of this site type is Old Man Mountain, a ceremonial site near Estes Park (Benedict 1985b). Vision quest sites with fasting features are known in the study area, but none have been dated to the Archaic.

Burials are the interment locations of human remains (CHS 1996). These may be separate locations, but are frequently associated with camps. Burials are not a common site type for any period and they are less common for the Paleoindian and Archaic stages. However, there are a few known Archaic-age burials in the Platte River drainage of Colorado. Most of the reported Archaic burials are associated with sheltered and open camps in the hogbacks of the Front Range.

Rock art sites contain either pictographs or petroglyphs. They may be found as isolated motifs or in groups on rock panels and are often associated with camps. The site type, while known in the Platte River study area, is relatively uncommon. Only a few of the known rock art panels have been dated. These are limited to those dated by relative means on the basis of design motifs such as shield figures and horses that are associated with Late Prehistoric/Protohistoric and Protohistoric occupations, respectively. No rock art sites in the Platte River Basin study area have been definitively assigned an Archaic affiliation.

In addition to site, one other types of cultural resource designation, the isolated find, is relevant to the prehistoric archaeology of the Platte River basin. Isolated finds are usually individual artifacts and occasionally small groups of artifacts, some of which have value as cultural/temporal diagnostics. Occasionally, also, seemingly isolated artifacts are actually the exposed portions of otherwise buried sites or the remaining remnants of disturbed sites.

SITE DESCRIPTIONS

Knowledge of the material culture and lifeways of the area's occupants is derived from individual site descriptions. The descriptions that follow are taken from site reports that have been tested and/or excavated. Most of the sites herein have also been dated by absolute methods. This information is supplemented by brief summaries of surveys, particularly important in the areas of North and South parks, for example, where there are no absolute-dated sites of Archaic age. The descriptions are grouped by period and by geographic area, Plains (which includes both the High Plains and Colorado Piedmont), Hogbacks/Foothills, and Mountains.

Early Archaic Period (7500 B.C.-5000 B.C.)

Unlike, the previous Paleoindian periods, the most abundant evidence for Early Archaic occupation in the Platte River drainage basin is derived from sites in the hogbacks/foothills and mountains, while the period is the least known on the plains. Figure 5-4 shows the distribution of Early Archaic sites discussed in the text.

Plains

Scant evidence is in the known archaeological record for Early Archaic occupation in the drainage basins of the Platte and Kansas rivers of eastern Colorado. Eighmy's (1984) research found no known radiocarbon dates for the period in the Colorado Plains, but cited Greiser's (1980) reporting of two sites for the period: Hutton-Pinkham, with no diagnostic artifacts, and 5WN26. Both were surface finds. The situation is only minimally improved. There are currently three dates for Early Archaic components, one each for Monaghan Camp (Tucker 1990), the Rock Creek site (Gleichman et al. 1995; Karhu et al. 1997; Gleichman and Karhu 1997), and the Willow Bunker site (Overturf and Feiler 1998). A fourth site, Hutton-Pinkham has been excavated since Greiser's report and has been dated to the Early Archaic/Middle Archaic transition (Larson et al. 1992). A fifth site, Massey Draw (Anderson et al. 1994), an open camp and butchering site, also produced a reliable radiocarbon age estimate for an Early Archaic hearth. This site, which lies immediately east of the Dakota hogback southwest of Denver, is included in the discussion of Early Archaic occupation in the hogbacks/foothills, due both to its relative geographic context and its likely cultural relationship with hogback sites. There is also a limited amount of evidence for Early Archaic occupation from sites such as the Wilbur Thomas and Slay shelters that lack absolute-dating (Breternitz 1971b; Brunswig 1996).

Several large surveys have been conducted for the Denver International Airport site and on the adjoining Rocky Mountain Arsenal lands (e.g., Burney and Mehls 1986, 1987a, 1987b; Tate et al. 1989a, Chandler et al. 1989; Tate and Mutaw 1991; Mutaw and Tate 1992; Burchett et al. 1985; Clark, B. J. [ed] 1997). In all, almost 40,000 acres were inventoried during a five-year period. These surveys revealed diagnostic artifacts representing the late Paleoindian stage through the Protohistoric stage. Although there was little evidence for Early Archaic occupation, Tate et al. (1989a) recovered a likely type MM 4 point and another comparable to the Mount Albion type.

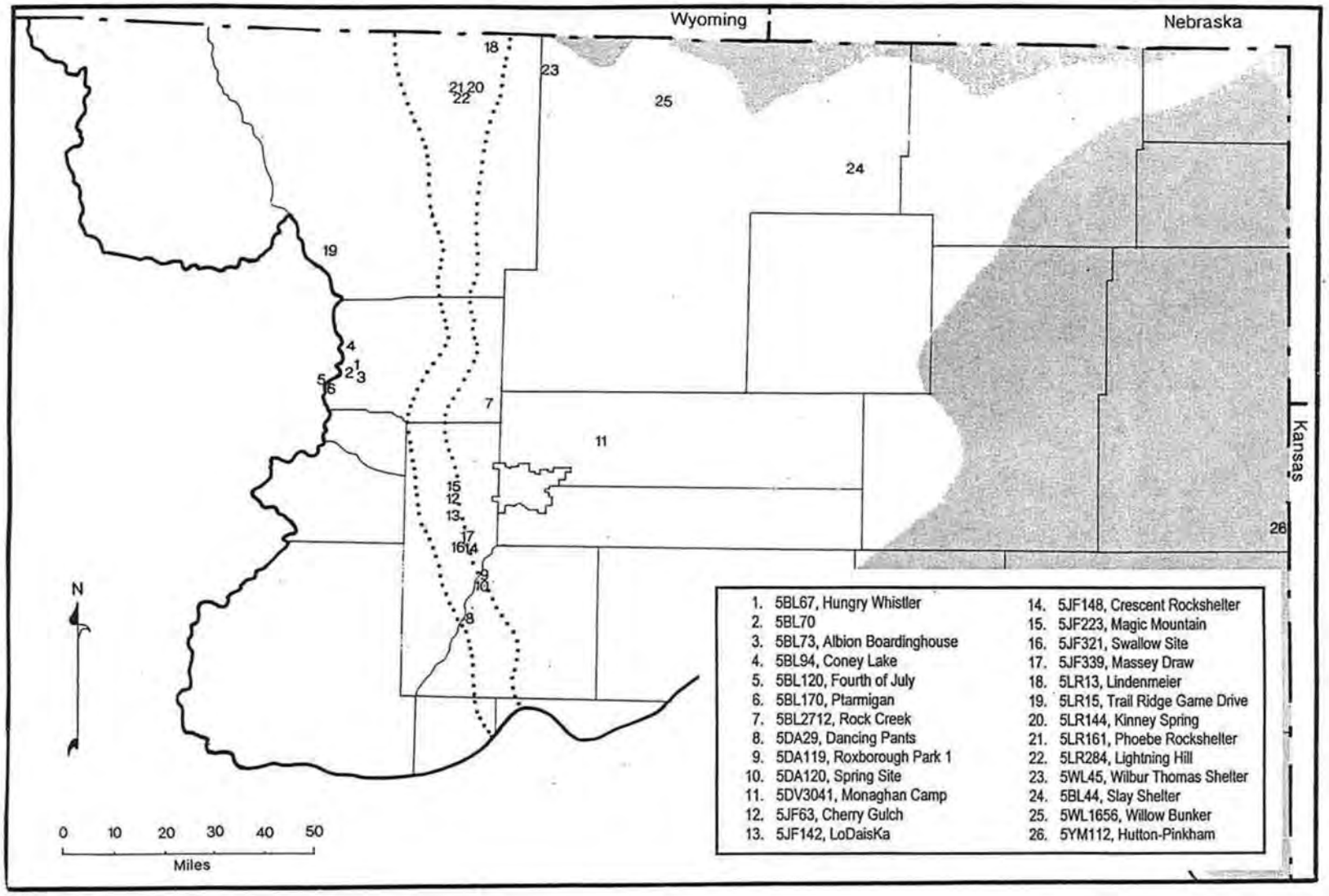

Figure 5-4. Locations of Early Archaic sites.

Monaghan Camp (5DV3041). This is one of numerous sites encountered during one of the inventories of the Denver International Airport site. The site, which no longer exists, was situated atop of a low knoll between what are now Concourses A and B. Three discrete concentrations of artifacts were found at the site, each associated with one or more of the eight hearths encountered during excavations at the site (Tucker 1990). A concentration of artifacts at the south end of the site (Block III) was found in association with Feature C, a shallow, basin hearth filled with charcoal-stained and -flecked soil. A radiocarbon sample from Feature C returned an age estimate of 4920 ± 210 B.P. (2-sigma range of 4224-3107 cal B.C.). The feature yielded an unusually large frequency of pollen for Saxifragaceae family, a member of which, alumroot, is used medicinally. The plant currently grows above 1,943 m (9,000 ft) in moist environments, indicating that the site's inhabitants may have gathered it during forays into the mountains. The hearth also contained charred goosefoot seed remains, indicating processing activities. Only one diagnostic artifact was recovered, a side-notched projectile point. However, because the implement had been reworked for use as a knife, it is not a good temporal indicator for site occupation. The artifact resembles the type MM 4 dart point from the Magic Mountain site and the Hawken Side-notched type found on the Northwestern Plains, both Early Archaic types. Lithic debitage, mostly secondary decortication and interior flakes of petrified wood, dominated the site assemblage, suggesting that tools were brought into camp either partially or wholly finished and completed, modified, or repaired between hunting forays. A knife, a few bifaces, and several utilized flakes indicate that the final processing of animals butchered elsewhere occurred at the camp. Ground stone was relatively abundant at the site; manos were made of locally available quartzite and granite stream cobbles, and tabular sandstone from the hogbacks to the west was used for metates. The radiocarbon age estimate for Feature C is several hundred years younger than Benedict's (Benedict 1979; Benedict and Olson 1978) later drought period. Soil studies at the site indicate that conditions prior to this first occupation were at least as dry or drier than present. The top of the pollen record, 30 cm below present ground surface, indicates a reduced relative frequency for the warm climate Cheno-Ams and increases in the relative frequencies for grasses, sagebrush, pine, and juniper, indicating cooler and possibly more mesic environment at the time (Tucker 1990).

Rock Creek Site (5BL2712). The site is situated on the north bank of Rock Creek on the plains near Broomfield, about 16 km (10 mi) east of the hogbacks/foothills transition zone. Located on land owned by the Boulder County Parks and Open Space Department, it was discovered by personnel from Native Cultural Services in 1989 and subsequently tested and excavated over the course of the next several years. The site is a multicomponent camp with evidence for occupations during the Early and Middle Archaic, as well as the Early and Middle Ceramic periods. Early Archaic evidence is confined to a single slab-lined hearth, Feature 12, found eroding from the creek bank at the north edge of the site. A charcoal sample from this hearth returned a radiocarbon age estimate of 6240 ± 190 B.P. (2-sigma range of 5563-4726 cal BC.). The hearth contained charred pigweed, goosefoot, bulrush, and cocklebur seeds, as well as a small amount of bone, but no associated artifacts (Gleichman et al. 1995).

Willow Bunker Site (5WL1656). This is a multicomponent open camp located on the toe of a large ridge extending onto the flood plain of Willow Creek in the Pawnee National Grassland (Overturf and Feiler 1998). The site was recorded by James Brechtel (1990), who reported finding a Hanna point on the surface. When Arapaho-Roosevelt National Forest personnel found a hearth eroding from the cutbank of an old ditch that crosses the site, the feature was sampled for charcoal. Though sparse charcoal was recovered, the sample returned a radiocarbon age estimate of 6910 ±

50 B.P. (2-sigma range of 5850-5638 cal. B.C.[Overturf and Feiler 1998]). Subsequently, the hearth and another feature were salvaged and additional excavation was carried out in 1999.

Wilbur Thomas Shelter (5WL451). This is a sheltered campsite located on the west side of a rock outcrop near the town of Carr in northern Colorado. Tested by Charles E. Nelson and Bruce Stewart in 1968, the site was excavated by the CU workers in 1969 (Breternitz et al. 1971b). Five occupations dating from the Plano period to Historic times were identified, although no radiocarbon dates were obtained. Two of the occupations, an Early Archaic one designated Mountain complex, and McKean complex of Middle Archaic times, were identified. The Mountain complex as defined by Grady (1971) was based on the similarity of artifacts found in the lower levels of Wilbur Thomas with those from dated levels at sites in the Middle Rockies. These sites, which were occupied during the Altithermal, include Mummy Cave (Wedel et al. 1968) and the Sorenson site, where Husted (1969) designated two branches, Plains and Mountain, for the period now known as Early Archaic. Points from Wilbur Thomas were found to follow patterns similar to artifacts from Layer 28 at Mummy Cave, Sorenson IV, and Magic Mountain, all considered to belong to the Mountain branch. The Wilbur Thomas points resemble the types MM 3 and MM 4 of the Magic Mountain complex and MM 22 of the Apex complex at Magic Mountain (Irwin-Williams and Irwin 1966). Grady (1971) also noted that firepits filled with burned stone were similar to those found at Magic Mountain and Sorenson IV.

Slay Shelter (5WL44). This site was originally tested by Wood (1967:456-461), who excavated two 1 x 1 m units and recovered a quartzite blade base, a quartz hammerstone, a unifacial mano, and two Woodland sherds. Workers from UNC subsequently reinvestigated the site, digging four units. Overall 1,200 flakes and more than 40 tools were recovered, including scrapers, a drill, gravers, bifaces, flake knives, utilized retouched flakes, and ground stone fragments. Units 3 and 4 were particularly productive for cultural materials. At a depth of 80 cm in Unit 4, a projectile point identified as a Mount Albion was encountered. The artifact exhibits substantial blade retouch and its hafting notches are moderately ground. The site is heavily vandalized, especially the Early Ceramic component, but the author reported that some of what is believed to be an Early Archaic component is intact (Brunswig 1992).

Hutton-Pinkham Site (5YM112). This is an open camp located in the High Plains on the banks of Bonny Creek at its confluence with the south fork of the Republican River. The site was tested by a group of amateur archaeologists in 1977; their target was a soil horizon at a depth of about two meters that was thought to represent Early Archaic occupation. Later excavations by the University of Wyoming in 1988-1989 revealed that these levels contained Pleistocene fauna, including camel. The later investigators found no artifacts in association with the bone at these deep levels. Archaic levels at the site were identified, however, and contained two projectile points, which were not fully described. Also recovered were bifaces, end scrapers, gravers, a drill, miscellaneous flake tools, four bifacial cores, and two pebble cores, as well as manos, slab metates, and hammerstones. Most of the flaked tools show extreme use, reflecting a paucity of tool stone materials in the site vicinity; all material types were from the general area, however. Also found were two tubular bone beads and two awls, made from rabbit and pronghorn bones. The largest artifact class found at the site is bone; bison is most common, but medium and small-sized mammals are also represented, as are several species of bird. A few freshwater snails and shell were also recovered. A single hearth was found in the Archaic levels. A charcoal sample from the hearth returned a radiocarbon age estimate of 4310 $\pm$ 200 B.P. (2-sigma range of 3506-

2405 cal B.C.), placing the site within the Early Archaic/Middle Archaic transition period (Larson et al. 1992).

Hogbacks/Foothills

Based on the history of archaeological investigations in the hogbacks/foothills of the Front Range, two major concentrations of sites are known are the foothills north and west of Fort Collins where several sites have been reported, and the hogbacks west of Denver. Several of these sites have been dated by absolute methods; the best known of these sites is Lindenmeier.

Lindenmeier Site (5LR13). This is an open camp located in a hanging valley in the foothills of northern Colorado. The site has long held a prominent place in Paleoindian studies (e.g.., Roberts 1935b, 1937b). As Anderson (1992:2) notes, the site is remarkable in that it is the first Folsom camp excavated, with the first stratigraphically controlled radiocarbon dates, as well as the first evidence of Folsom ground stone and decorative arts, bone and hematite beads. The author further notes that early investigators found items associated with later occupations above the Folsom level, but that in the excitement of the Folsom discovery, this evidence was generally ignored. The items, mentioned in various early letters, included Alberta points and Cody complex artifacts from the Plano period, a point comparable to those known from Gypsum Cave, and several Late Prehistoric points. A well-known amateur archaeologist, Jack Moomaw, collected a charcoal sample from the site. Based on Moomaw's 1949 letter to Frank Roberts, Anderson (1992:5) reports that the charcoal was found in situ and in direct association with lithic flakes, but not in the Folsom level. Submitted by Roberts in 1950, the sample returned a radiocarbon age estimate of 5020 $\pm$ 300 B.P. (2-sigma range of 4460-3036 cal B.C.), a date considered erroneous by subsequent researchers (Haynes 1992; Wilmsen and Roberts 1984). In 1992, Anderson, of the National Park Service (NPS), led a team of archaeologists on an inspection of the site, now a National Historic Landmark. During their visit, Ann Johnson discovered a rock-filled hearth eroding from the bank of a tributary arroyo, in the general location from which Moomaw's sample was obtained. On a return trip, the hearth was salvaged. A charcoal sample from the hearth yielded a radiocarbon age estimate of 5280 $\pm$ 80 B.P. (2-sigma range of 4328-3953 cal B.C.). Unfortunately, no diagnostic artifacts were associated with the feature. Flotation of hearth fill revealed charcoal, mostly pine and a small amount of cottonwood, both of which are currently found several miles from the site. *Opuntia* comprised 35 percent of the phytoliths in the hearth fill, yet the modern sample yielded two percent, leading to the conclusion that prickly pear was a major food source of the site's inhabitants. Pollen from the hearth included small amounts of pine, juniper, and grasses. Also represented were willow and cattail and larger amounts of sagebrush, composites, and Cheno-Am (Cummings 1992). The latter, of high frequency in hearth fill relative to the surface sample, may indicate warmer and drier conditions than present, a cycle of erosion, or ground disturbance such as a busy camp might cause. However, based on the various lines of evidence, the Anderson (1992) concluded that the relative frequencies of the phytoliths present reflect a higher water table than there is presently.

Also in the foothills northwest of Fort Collins are several sites that were investigated over several years in conjunction with CSU's Archaeological field school. The sites are multicomponent open and sheltered camps with various Archaic stage and Early Ceramic period components. A few of the sites, Phoebe Rockshelter (5LR161), Kinney Spring (5LR144, Site C), Lightning Hill (5LR284), and Spring Gulch (5LR252), have revealed evidence for Early Archaic occupation. However, at Spring Gulch, projectile points generally considered indicative of Early

Archaic occupations are found in association with McKean artifacts and radiocarbon age estimates are generally within the Middle Archaic time frame. Thus, the site will be discussed in a subsequent section. Only limited information is available for the Kinney Spring and Lightning Hill sites (see Morris et al. 1985; Morris and Marcotte 1977).

Phoebe Rockshelter (5LR161). Evidence for Early Archaic occupation at this sheltered camp was found in Natural Stratum 4, from which a composite charcoal sample produced a radiocarbon age estimate of 4810 ± 120 B.P. (2-sigma range of 3906-3346 cal B.C.). Though there are no features, a few artifacts are associated with this stratum. The tools include a small, side-notched projectile point with basal and notch grinding, an Altithermal Side-notched point resembling a Hawken type, and two large, side-notched bifaces that were probably hafted knives. Thompson (1986) found the artifacts to be similar to those from the high altitude Hungry Whistler site (Benedict and Olson 1978) and other Early Archaic sites.

Kinney Spring Site (5LR144, Site C). This is an open camp located on a south-facing slope above a creek. The site is named for a nearby spring. The site contains evidence for Early Archaic to Early Ceramic period occupations. The deepest levels of the site produced hearths and flakes, but no diagnostic artifacts. A charcoal sample returned a radiocarbon age estimate of 5410 ± 70 B.P. (2-sigma range of 4361-4043 cal B.C.), the earliest of a suite of dates from the site (Morris et al. 1985)..

Lightning Hill Site (5LR284). This is a open camp located about 3 km (2 mi) north of Livermore. Occupied intermittently from Early Archaic through Early Ceramic times, the site's deepest levels produced four slab-lined hearths. A charcoal sample from one of these hearths returned a radiocarbon age estimate of 5390 ± 165 B.P. (2-sigma range of 4541-3808 cal B.C.) Mallory point fragments were found in association with and beneath these early hearths (Morris and Marcotte 1977).

Several large surveys have been conducted in the hogbacks/foothills transition region. A survey in the Lykins Valley conducted by CSU revealed two sites with Mount Albion-type projectile points (Morris et al. 1979). Northwest of Loveland, another inventory by CSU recorded 27 prehistoric sites; seven of the sites yielded projectile points diagnostic of Early Archaic occupation, including one that resembles a Mount Albion point (Travis 1988). West of Boulder, numerous surveys have been undertaken, many for city and county entities, but also for proposed industrial development. Grant et al. (1996), for example, in a survey of Southern Rabbit Mountain and North Foothills Open Space found artifacts documenting occupation for all three Archaic periods and the Early Ceramic period, as well. The artifacts included a Mount Albion Corner-notched type, an isolated find. Another open space inventory, of 1,840 ha (4,600 acres) in the northern Boulder Valley, documented numerous prehistoric sites. At site 5BL2714, a Mount Albion point was found (Gleichman and Phillips 1996).

In the hogbacks and foothills west of Denver, a second group of sites is concentrated. These sites have been the subject of investigation since the 1940s, by both professional and avocational archaeologists. Like their counterparts to the north, the sites include both open and sheltered camps, and almost always contain multiple components dating from the Archaic period. This collection includes the Roxborough Park Site #1 (Scott 1963) and Spring sites, Dancing Pants Shelter (Liestman and Kranzush 1987), LoDaisKa (Irwin and Irwin 1959), Magic Mountain (Irwin-Williams and Irwin 1966; Kalasz et al. 1995; Kalasz and Shields 1997), Cherry Gulch

(Nelson 1981), Massey Draw (Anderson et al. 1994), the Crescent Rockshelter (Adkins 1997; Stone and Mendoza 1994), and Swallow (Hammond and Rathbun 1998), the latter two on the Ken-Caryl Ranch.

Roxborough Park Site #1 (5DA119). The site was first recorded by Arnold Withers of the University of Denver (DU) in 1949. Here, an archaeological layer was found 1.2 m (4 ft) below the top of the Recent colluvium in a cut in the slope west of the Dakota hogback. Charcoal from this cultural layer returned a radiocarbon age estimate of 5780 ± 160 B.P. (2-sigma range of 4994-4333 cal B.C.) (Rubin and Suess 1956:446). Artifacts from this layer were described as shallow bowl metates, manos, projectile points, choppers, scrapers, and bone tools. In association were hackberry seeds and faunal remains of grizzly bear and deer (Scott 1963). During rerecording of the site in 1971, Ruthanne Knudsen noted that two projectile points were found on the site surface and an additional five were recovered from the excavation. Of the seven points, six were side-notched and one was a distal fragment. An estimated 600-700 flakes were present, a third of which appeared to be heat treated. Quartzite was the predominant material, followed by chalcedony and petrified wood.

Spring Site (5DA120). This site, located on a hill slope on the east side of a small arroyo north of Willow Creek, was recorded by Alice Hunt in 1950. Little is known about the site, but charcoal from a deposit of pre-Piney Creek alluvium on site returned a radiocarbon age estimate of 5440 ± 160 B.P. (2-sigma range of 3988-3344 cal B.C.) (Rubin and Suess 1956; Scott 1963). Although both mammoth teeth and cord-marked pottery were found at the site, no Archaic artifacts were noted.

A later survey of Roxborough State Park conducted by the Office of the State Archaeologist of Colorado (OSAC) yielded Early Archaic type MM 4 points (Tate 1979). South and west of this area, an inventory for the proposed Two Forks Dam revealed 78 prehistoric sites, including 5DA29, discussed below. Artifacts from this survey also included Early Archaic diagnostics, including the type MM 4 projectile point (Windmiller and Eddy 1975).

Dancing Pants Shelter (5DA29). This site is located in the foothills just west of the hogback zone on a moderately sloping east bank of the South Platte River immediately south of its confluence with the river's North Fork. The site was recorded in 1974 and tested in 1975 during the initial Two Forks Archaeological project (Windmiller and Eddy 1975). In preparation for eventual inundation by the proposed reservoir, the site was excavated in 1986. This investigation revealed evidence for almost continuous occupation of the site from 5800 to 400 B.P., except for a brief hiatus in Late Archaic times. Though the occupation was most intense during the Middle Archaic period, a group of hearths (Features 16, 19, and 26) located in the central part of the shelter provided limited evidence for occupation during the Early Archaic period. Feature 16 consisted of two superimposed hearths. A radiocarbon sample from the lower part of the feature yielded an estimated age range of 4720 ± 100 B.P. (2-sigma range of 3699-3123 cal B.C.); associated cultural material included a Mount Albion projectile point, several flaked lithic tool fragments and ground stone. Feature 19 was a basin-shaped hearth, with burned bone and a few flakes in association. Charcoal from the feature returned a radiocarbon age estimate of 4670 ± 120 (2-sigma range of 3496-3039 cal B.C.). Feature 26 was a hearth, charcoal from which returned a radiocarbon age estimate of 4610 ± 90 B.P. (2-sigma range of 3629-3039 cal B.C.). This feature was defined by a pocket of burned rock and gravel interspersed with charcoal, bone and lithic flakes. Cultural

materials from the south half of the nearby excavation unit included 30 bone fragments, a tooth, 19 lithic flakes, ground stone, a graver, a biface fragment, and quartzite cobbles (Liestman and Kranzush 1987).

LoDaisKa Site (5JF1421). A few miles to the north of Roxborough State Park is the LoDaisKa site, a sheltered camp located beneath a west-facing outcrop of Fountain Formation sandstone overlooking Strain Gulch, about 1.6 km (1 mi) south of Morrison. In the late 1950s, an excavation by Henry and Cynthia Irwin resulted in the identification of several cultural units or occupations. Four cultural complexes were also identified, extending from the Early Archaic to Early Ceramic periods. Their divisions are admittedly arbitrary and based on typology, with some overlap. The fill at the site was shallow, with an absence of stratigraphically isolated units. This resulted in the mixing and telescoping of occupations and materials. The Early Archaic Complex D was identified as "....a manifestation of the so-called Desert Culture with roots in the Great Basin" (Irwin and Irwin 1961:114). This complex was defined from cultural materials beginning at a depth of 55 inches and extending to the top of the late Wisconsin Alluvium, with the "purest" manifestation below 72 inches. A charcoal sample from an early level of Complex D returned a radiocarbon date of 4840 $\pm$ 250 B.P. (2-sigma range of 4224-2917 cal B.C.), the earliest in a suite of dates from the site (Irwin and Irwin 1961). (It should also be noted that beneath the Complex D zone, within the Late Wisconsin outwash, a projectile point fragment identified as Plainview was found in association with a few flakes, charcoal, ash, and burned bone.) In addition to hearths, there were three cists associated with Complex D. One held a cache of acorns; another contained small quantities of Gramineae and Boraginaceae sp., seeds of which are ethnographically known to have been eaten. The flaked lithic materials from the complex included a group of distinctive, large corner and side-notched dart points, which the authors (Irwin and Irwin 1959) compared to types from Danger Cave (Jennings 1957) and the Uncompahgre sites of Wormington and Lister (1956). Also in Zone D were Type G points, two of which resemble the stemmed Park point (Stewart 1970), which are related to Great Basin types dating to ca. 4000-3000 B.P. (Benedict 1981). In addition to points, flaked lithic artifacts included triangular knives, several types of scrapers, drills and perforators, utilized flakes, prismatic flakes, and choppers and hammerstones. Bone artifacts included splinter awls, antler flakes, tubular beads, and incised gaming pieces. A tooth pendant, a limestone pendant, a clay ball, worked mica, wood shafts, and ocher and paint stones (ground palettes) comprised other miscellaneous items. Deer dominated the faunal assemblage and various plant remains were found (Irwin and Irwin 1959). A few bison, elk and bighorn sheep (one each), and various smaller mammals such as rabbit, beaver, *canis* sp., skunk, and small rodents were represented in the site's faunal remains (Lewis 1959). The only identified carbonized remains were immature beans (*Lupinus* sp.) that were possibly roasted (Galinat 1959).

Of particular interest is the fact that three specimens, including fragmentary cobs, of Chapalote-type *Zea mays* were found at a depth of 1.9-2.1 m (75-82 inches) with pollen probably from maize and assigned to Complex D ((Whitehead 1959; Irwin and Irwin 1959:106. In a later report, however, the authors (Irwin and Irwin 1961:114-115 provide bracketing radiocarbon age estimates of 3150 $\pm$ 100 B.P. (2-sigma range of 1885-868 cal B.C.) to the 4840 $\pm$ 250 B.P. cited above. In the same article, however, they assign the younger age estimate and a second, intervening one to Complex C, which they associate with Middle Archaic occupation characterized by McKean Complex artifacts. At that point, Irwin and Irwin (1961) have expanded the age and cultural affiliation possibilities to more recent times. Specimens of two other types of maize were found associated with the younger Complex C and B zones. Wanner and Brunswig (1992) have argued that although there is some depositional mixing at LoDaisKa, the evidence suggests that a

corncob and kernels may have been loosely stratified in the Archaic deposits and that redepositional mixing, particularly from the post-Archaic Woodland is probably minimal. Wanner and Brunswig (1992:378-379) have cited two lines of evidence in support of this supposition. First, there is an absence of Woodland points at the level of the earliest Chapolote maize occurrences and a presence of points resembling some in the Oshara tradition of northern New Mexico that were recovered in general stratigraphic association with the earliest maize. Second, the stratigraphic succession of maize types at the site is consistent with the chronology of their development in the western United States. However, mixing of the site's stratigraphy was acknowledged by the Irwin and Irwin (1959). Because the extent of such mixing is actually unknown, any explanations of a possible early age for the maize must, therefore, be viewed with skepticism.

Magic Mountain Site (5JF223). In the Golden vicinity, the Magic Mountain site is an open camp with evidence for occupation from the Early Archaic through the Early Ceramic periods. The site is located along the banks of Apex Gulch, on the south slope of the Lyons Sandstone hogback ridge between the foothills of the Front Range and the dominant Dakota Sandstone hogback. Although the site has a long history of archaeological investigations, the most comprehensive of the early studies, as noted by Kalasz and Shields (1997), was conducted in 1959 by Cynthia and Henry Irwin, representing Harvard University (Irwin-Williams 1963; Irwin-Williams and Irwin 1966), following their excavation of the LoDaisKa rockshelter (Irwin and Irwin 1959). The Irwins' multi-disciplinary approach and subsequent publication became a major reference for work in the region (Irwin-Williams and Irwin 1966). Most recently, two phases of excavation were conducted by Centennial Archaeology, Inc. in 1994 and 1996. The latter work, which focused on the Early Ceramic levels at the site, has served to clarify the chronology and subsistence patterns for the Archaic occupations at the site, as well (Kalasz et al. 1995; Kalasz and Shields 1997).

Irwin-Williams and Irwin (1966) described geological Units 1-7 and archaeological Zones A-F, which largely correspond, except that there is no archaeological zone correlative to Unit 6. A charred wood sample from the top of Unit 6 between zones E and F produced a radiocarbon age of 4900 $\pm$ 250 B.P. (2-sigma range of 4311-2930 cal B.C.). From this the authors estimated that the lower Zone F covers 500 years of occupation. (Recent geomorphological studies have indicated that a hiatus between the deposits of Units 7 and 6, including a period of stream incision, likely corresponds to the Altithermal [Kalasz and Shields 1997]). Units 3-5 and zones C-E were inferred to encompass younger Archaic occupations, while Unit 1/Zone A and Unit 2/Zone B were believed to cover the latter part of the Late Archaic period and the entire Early Ceramic period, as they are now designated. The earliest defined cultural unit, the Magic Mountain complex, corresponds with the Early Archaic. The complex is characterized by a prismatic flake industry materials of which were found in Zone F and parts of Zones E-D (Kalasz and Shields 1997). Artifacts included finely made scraping tools, perforators, and grinding slabs, as well as a variety of projectile points, which included distinctive, concave-based MM 3 and large, triangular, corner-notched MM 4 points with convex to straight bases (Irwin-Williams and Irwin 1966; Eighmy 1984; Guthrie et al. 1984).

Cherry Gulch Site (5JF63). The site is another open camp located in the hogback area. Cherry Gulch is located in a small valley overlooking the gulch for which the site is named, between outcroppings of Lyons Sandstone and Lykins Formation north of Red Rocks. Excavated from 1973 through 1975, investigators found a well-stratified multicomponent site with evidence for several Archaic occupations, as well as Early Ceramic use of the site. The site contained several

small hearths with stones but no charcoal. Ground stone and scrapers were found in all occupational levels, but few blades, hammerstones, or choppers were found. Mule deer bone was also found in all levels and bighorn sheep bone was recovered in the Archaic levels. Projectile point Types 1 and 2 specimens were recovered from Early Archaic levels. The points are similar to the Mount Albion type, but lack the characteristic basal grinding. Nelson (1981) also noted their resemblance to some from the Mountain Complex in pre-McKean levels at Wilbur Thomas Shelter and to the Magic Mountain type MM 3 (Irwin-Williams and Irwin 1966). A radiocarbon age estimate, obtained from charcoal in Grid Q at the site returned an age estimate of 5730 ± 220 B.P. (2-sigma range of 5193-4048 cal B.C. [Nelson 1981]).

Massey Draw Site (5JF339). This multicomponent Archaic camp and bison processing site was investigated by the Colorado Department of Highways (CDOH) in 1985 in conjunction with construction of Colorado Highway C 470. The site is situated mainly on an alluvial terrace southwest and adjacent to Massey Draw immediately east of the Dakota hogback, southwest of Denver. Radiocarbon dating indicated intermittent and short-term occupation from sometime prior to 6400 B.P., with primary occupations during the Early and Late Archaic periods and the greatest evidence from the latter period. Two artifactually distinct areas were identified, a camp and bone area; however, evidence is available only in the camp area for the Early Archaic component. Radiocarbon dates documenting the Early Archaic occupation include 6150 ± 150 B.P. (2-sigma range of 5421-4722 cal B.C.), dating a rock alignment; and 6440 ± 110 B.P. (2-sigma range of 5573-5143 cal B.C.) from Feature 5, a circular rock-filled hearth. Both features were found in Level B in the camp area. Feature 10 which consists of redeposited hearth debris, is considered to be Early Archaic as well because of its proximity to these features. Two pollen columns were taken at the site; one dated from 8620 B.P. to present and the other from 6440/6150 B.P. to present. The lowest levels of both contained very high frequencies of Cheno-Ams with lower frequencies of *Artemisia* sp., Gramineae family, and arboreal pollen representing the warm and dry conditions of the Altithermal episode. Cultural materials associated with Feature 5 include debitage (almost all tertiary flakes of quartzite) as well as unifaces, a few unnotched bifaces, and a single unstemmed biface fragment, most of which are manufactured of petrified wood. Three ground stone fragments were also recovered. A limited amount of bone included a few from an unidentified medium-sized mammal, and others representing rodent and carnivore. Tool manufacture and use for cutting and scraping activities, vegetal processing, and food preparation are inferred to be the main activities, with little evidence for animal processing or consumption during the Early Archaic (Anderson et al. 1994).

Immediately west of the Dakota hogback and the Massey Draw and Dutch Creek sites are several sites that were excavated by the Denver Chapter of the Colorado Archaeological Society (CAS) on the Ken-Caryl Ranch. Among these are Bradford House II, Bradford House III, Twin Cottonwoods, and Falcon's Nest on the north ranch, and Crescent, Southgate, and Swallow on the south ranch. All but Southgate had evidence for Archaic occupations. At two sites, Crescent and Swallow there were Early Archaic manifestations, and a third, Bradford House III, may also contain evidence for Early Archaic occupation. Surveys of the north and south portions of the ranch resulted in the identification of additional sites as well.

Crescent Rockshelter (5JF148). The site is a deeply stratified sheltered camp, located in a south-facing outcrop west of the Lyons escarpment on the south end of the Ken-Caryl Ranch southwest of Denver. The site is one of a group that has been investigated over the last 25 years by members of the Denver Chapter of CAS (Johnson 1997). The site was excavated by members of CAS in

1980, 1982-1983 and by University of Colorado at Denver (UCD) field school and Metropolitan State College (MSC) in 1992-1993. During the 1980 field season, several radiocarbon age estimates were obtained from charcoal samples. These samples indicate occupations during the Early Archaic and Early Ceramic periods. A sample from Grid D9, Level 19, provided an estimate of 5680 ± 110 B.P. (2-sigma range of 4784-4333 cal B.C.). The Smithsonian Institution brought a backhoe to the site and dug a trench in the midden area. A sample from a charcoal lens exposed briefly in the trench, which soon collapsed, returned an age estimate of 6200 ± 240 B.P. (2-sigma range of 5577-4540 cal B.C.) (Adkins 1997). A master's thesis on the computerization of the excavation data has been produced (Ford 1983), but no site report of the CAS excavations has been written. The UCD excavations recovered three fragmentary artifacts diagnostic of the Plano period and several Early Archaic projectile point types. Representative of the latter were MM 2 points, a fragmentary MM 3 point, and specimens of the LoDaisKa type E. McKean points were also recovered, as were lithic artifacts and ceramics identified with the Late Archaic/Early Ceramic period. A single radiocarbon age estimate was reported by the UCD researchers, indicating post-Archaic occupation of the site. Comparison of lithic and faunal materials from the deposits of the various periods indicated no differences in economic organization and mobility over time (Stone and Mendoza 1994).

During the CAS excavations at the Crescent site, a burial was encountered, the only Early Archaic feature of this type known in the Platte River basin in Colorado; the earlier Gordon Creek Burial is a late Paleoindian manifestation (Anderson 1966). The Crescent site interment was the remains of a single adult and was possibly a pit burial; however, if a pit was present, it was not defined. The individual had been placed on its right side with arms and legs flexed, and its head to the east, facing north (Adkins 1997). The condition of the burial was poor; the bones were very delicate and fragmentary. Laboratory analysis revealed that the individual was a female, 30-40 years old at the time of death (Finnegan and Kilgore 1997).

Swallow Site (5JF321). The site is a sheltered camp located on the west side of a large Fountain Formation monolith immediately east of a natural spring at the southern end of the Ken-Caryl Ranch. The site, which was excavated by members of the CAS from 1983 through 1998, is a deeply stratified multicomponent camp whose occupation was interrupted when a large piece of rock exfoliated from the wall of the shelter and fell as a single block covering a portion of the floor, apparently in Early or Middle Archaic times. There is evidence for prehistoric occupation of the site from possibly Paleoindian times, through all of the Archaic, and during Early Ceramic, during which use of the site was most intense. After removal of the rock fall, investigators found beneath it a charcoal-rich layer about 10 cm below the bottom of the rock. This layer appeared to be a living surface. However, there were no well-defined hearths and few fire-altered rocks. Artifacts recovered included a Folsom point fragment, two probable Archaic projectile points, knives, scrapers, and debitage. Most of the flaked lithic artifacts, however, were expedient tools. Ground stone was less common in these deeper levels at the site. There were moderate amounts of deer bone, including some probable tools. The majority of the recovered materials came from the charcoal/ashy layer near the base of the rock fall. Charcoal samples returned radiocarbon age estimates of 7170 ± 60 B.P. (2-sigma range of 6121-5876 cal B.C.) from this layer and 8320 ± 60 B.P. from a somewhat deeper level (Hammond and Rathbun 1998).

Mountains

Early Archaic occupation in the mountains of the Platte River Basin is best known in the Indian Peaks region of the Front Range, a result of a long-term research commitment by James Benedict and colleagues, whose investigations at sites such as the Hungry Whistler and 5BL70 (Benedict and Olson 1978), Ptarmigan and the Fourth of July Valley (Benedict 1981), Albion Boardinghouse (Benedict 1975a), Coney Lake (Benedict 1990), and Trail Ridge and Flattop Mountain game drives (Benedict 1996) have provided much of information known about the period and provoked a good deal of theoretical discussion as well.

Hungry Whistler Site (5BL67). This is a high-altitude site, located east of the Continental Divide, that was occupied in late summer or fall (the area is snow-covered until late June). Hungry Whistler is a game drive and butchering area. The butchering locale is located on a terrace to the west of the game drive. The game drive is one of five that are located on the flanks of Mount Albion and one of dozens in the general area that extend into Grand and Larimer counties as well. The game drive includes a dry-laid stone wall and 187 cairns in lines and diffuse zones. The principal line is 85 m long. Two circular stone enclosures are nearby. The site produced a suite of radiocarbon ages from charcoal at the site, all but one from the Early Archaic period. The Early Archaic dates are 5220 ± 190 B.P.; 5300 ± 130 B.P.; 5520 ± 190 B.P.; 5730 ± 130 B.P. ; and 5800 ± 125 B.P. (2-sigma ranges of 4456-3641 cal B.C.; 4434-3799 cal B.C.; 4784-3961cal B.C; 4902-4336 cal B.C.; and 4938-4360 cal B.C., respectively) (Benedict and Olson 1978). The predominant site functions were game driving and butchering. The close association of tools in the butchering area suggests cool-weather, hearthside activities. There the principal activity was the repair of butchering tools; few or no new tools were made. Forty Mount Albion projectile points were recovered, as were three stemmed, indented-base points and one stemmed, concave-base points. These artifacts were made of quartzite, chert, chalcedony, petrified wood, argillite, and rarely quartz. Mount Albion points are large, shallowly corner-notched or side-notched dart points with convex bases and asymmetrical blades, caused by their hafting and secondary use for butchering. They are characteristically made of poor-quality materials and exhibit often heavy basal and notch grinding. Other tools include 27 milling slab fragments and 31 possible pigment stones. Due to vertical mixing, it was impossible to relate tools with specific projectile points or radiocarbon ages. However, based on the abundance of the Mount Albion points, Benedict and Olson (1978) believe that people of the Mount Albion Complex were the principal occupants of the site.

Mount Albion points have been found at several other game drives, as well. These include 5BL68 on Albion Ridge, 5GA35 and 5BL147 on Rollins Pass, and 5LR80 on Flattop Mountain (Benedict and Olson 1978).

Site 5BL70. The site is a camp that is located on a well-drained slope in the vicinity of the Hungry Whistler Site. Radiocarbon ages, all from charcoal, are 5350 ± 130 B.P.; 5650 ± 145 B.P.; and 7650 ± 190 B.P. (2-sigma age ranges of 4458-3823 cal B.C; 4809-4170 cal B.C.; and 7008-6050 cal B.C., respectively). The site artifact assemblage included 32 projectile points, 27 Mount Albion corner- or side-notched, three Hogback corner-notched, one small corner-notched, and the base and hafting area of a fragmentary projectile point, possibly a hafted knife or preform. There were numerous milling slabs and handstones and an abundance of waste flakes at the site but a scarcity of butchering and hide-working implements. There was also a cobble-filled hearth. Based on the data recovered, Benedict and Olson (1978) concluded that the site functions included

camping by small groups, mainly Mount Albion groups, floral food roasting or heat treating of stone, stone tool repair, and late-stage reduction for new tool manufacture mostly from argillite; and that butchering was not an important activity.

Ptarmigan Site (5BL170). This site is a multicomponent camp located on a well-drained bedrock bench south of the North Fork of Middle Boulder Creek, in an area where several other sites evidence travelers to the upper valley and Arapaho Pass. Excavated from 1973 to 1975 the site showed no stratigraphic separation due to vertical frost sorting. However, radiocarbon samples from tool resharpening areas have been dated, and several artifacts have been associated with these areas based on the presence of specific, shared, rock types. The initial occupation had dates of 6205 ± 170 B.P. (2-sigma range of 5443-4728 cal B.C.) and 6450 ± 110 B.P. (2 sigma range of 5575-5146 cal B.C.), making this site the oldest of the high altitude Front Range sites. These dates may be related to Feature I, a steep-sided basin hearth. The date may also be associated with several small utilized flakes in Areas C and D, resharpened flakes in Area B, a side-notched point of silicified wood, and two unclassified projectile point fragments of the same material. The side-notched point is one in a "...typological continuum that existed during the Altithermal, across much of the northern United States and Canada..." (Benedict 1981:113). Although the type is not commonly found in the Colorado mountains, it resembles Mummy Cave points of the Central and Northern Rockies, as well as several points from the Great Basin, e.g., Northern side-notched, Bitterroot, and others found in occupations at the eastern margins of the plains, such as Simonsen and Logan Creek corner-notched points. Benedict (1981) has interpreted this component as a short-term camp by a hunting party with ties to the mountains and foothills to the north, where tool repair and manufacture occurred, and possibly secondary butchering. Reoccupation of the Ptarmigan site is represented by two hearths and numerous other charcoal concentrations. Feature II, a basin hearth, and Feature III, described as an open fireplace, produced dates for the latter occupation of 4620 ± 95 B.P. and 4700 ± 95 B.P. (2-sigma range of 3634-3039 cal B.C. and 3664-3110 cal B.C., respectively). Associated artifacts of Feature III include resharpening flakes from Area A, at least two triangular bifaces, a spokeshave, a split pebble scraper, and seven fragmentary corner-notched projectile points. Some grinding implements found nearby may also be associated with this occupation. The points are considered by the author to be derived from Mount Albion points, but they exhibit less basal and notch grinding. Benedict (1981) notes that these points first appear in the Front Range during the late Altithermal, are found in northern foothills and plains sites such as Spring Gulch and Dipper Gap during Triple Lakes times, and continue in use through the Late Archaic at hogback sites in central Colorado, including LoDaisKa, Magic Mountain, Willowbrook, and Van Bibber Creek and in Front Range sites such as Coney Lake. The component is interpreted as a camp where hunters with a long tradition of Front Range occupation butchered game animals and repaired tools (Benedict 1981).

Fourth of July Valley Site (5BL120). The site is a camp located on a glacial moraine near the headwaters of Middle Boulder Creek in a region subject to cold, wind, and moderate to heavy snowfall. The area was, attractive to prehistoric people, however, because it is in an ecotone, with stream, and the location provides access to an east/west pass, as well as tundra grazing for big game hunting. Excavated in 1971, the site yielded two radiocarbon age estimates: 5880 ± 120 B.P. (2-sigma range of 5052-4464 cal B.C.) from a shallow basin hearth and 6045 ± 120 B.P. (2 calibrated range of 5251-4688 cal B.C.) from an irregular concentration of charcoal on an eroding surface of Units A-2 and A-3. Both are viewed as dating a single occupation. Artifacts recovered from the excavation include 18 projectile points and fragments. A few bifacial cutting tools and fragments, some edge retouched flakes, a utilized prismatic flake, a chopper/scraper, a core, five

perforators, 1,392 waste flakes, and two sandstone milling stone fragments complete the assemblage. Most of the material, 89.9 percent, is quartzite from Spanish Diggings in Wyoming and 10.1 percent is chert or chalcedony. There is a stemmed indented base point of Dakota quartzite and a chalcedony knife of Troublesome chert. The site's artifacts were found to be extensively redeposited as a result of geologic processes. Projectile points recovered from the surface of the site included two Mount Albion types and three Park points. The assemblage suggests that a small band of hunters camped briefly to replace their broken projectile points and process game. A problem with interpretation of the site's history is that some points are at least stylistically late Paleoindian. Benedict (1981) argues, however, that the dates are accurate and views those associated projectile points as evidence of a transition in the development of McKean and Duncan from terminal Paleoindian types, such as James Allen and Pryor Stemmed. He notes that the points are intermediate in form, size, and manufacturing technique; parallel oblique and random flaked are both represented, the stems and lower blades have heavy grinding, but basal notches are unground or lightly ground. Based on the radiocarbon dates, the site is also intermediate in age, 1,500 years younger than oblique-flaked Paleoindian points in context and 1,000 years older than McKean lanceolate and Duncan points from the plains. (It is possible, however, that the radiocarbon samples were contaminated by younger material or that the artifacts in question represent curation of earlier points.) For the reasons cited, Benedict has interpreted this as one of the high-altitude occupation sites documenting an influx of low-elevation people into the Front Range during the severe late Altithermal. The predominant tool stone, Spanish Diggings quartzite, is seen as suggesting contacts to the north, supporting a claim of McKean incursion (Benedict 1981).

Albion Boardinghouse Site (5BL73). This is an open camp located on a valley floor in a subalpine forest. Two radiocarbon dates were obtained from the site: 5730 $\pm$ 145 B.P. (2-sigma range of 4917-4266 cal B.C.) from the lower level of a charcoal layer and 2420 $\pm$ 220 B.P. (2-sigma range of 1004 cal B.C.-A.D. 53) from the upper level. Benedict (1975a) believes that both likely represent redeposition from an original occupation area on the site. Artifacts in association with the upper charcoal layer included several large, side-notched projectile points. The points are similar to Mallory points, seen by Lobdell (1974) as either a specialized adaptation of McKean Complex hunters to large game or that of a cultural group that participated in communal game procurement with McKean groups. Like the Fourth of July Valley site, described above, there is a problem with both of the radiocarbon dates in association with McKean complex or Mallory artifacts as both the are traditionally dated to the Middle Archaic period. (Benedict 1975a) has argued that the earlier date represents the actual time of an Archaic occupation, while the later date represents a natural event after which erosion and redeposition of cultural material occurred, but it is possible that it dates a later occupation.

Coney Lake Site (5BL94). This site is located in subalpine forest near timberline in a valley that extends northeast from the Continental Divide. The site is a multicomponent camp (six components from Early Archaic to Early Ceramic) of hearths and roasting pits differentially affected by frost disturbance, with the oldest being in worst condition. However, many of the artifacts could be related by horizontal distributions and rock types to radiocarbon-dated lithic workshops. A radiocarbon age estimate of 5710 $\pm$ 115 B.P. (2-sigma range of 4809-4339 cal B.C.) dates a late Altithermal occupation, represented at Lithic Workshop III, where charcoal from a probable hearth remnant was found. In general association were a stemmed-indented basal fragment of a Kremmling chert point, and biface fragments and flakes of chert and jasper from Middle Park. A similar point fragment was also found elsewhere on the site. The points are

comparable to both Pinto and Duncan and interpreted by Benedict (1990) as transitory in the development of Duncan points. The Early Archaic component was a hunting camp and secondary butchering station where meat and hides were prepared and tool kits were refurbished (Benedict 1990).

In addition to 5BL94, there are three intercept-hunting sites (5GA55, 5BL97, and 5BL688), a multicomponent camp and primary butchering station (5BL96), five hunting camps or secondary-butchering stations or both (5BL95, 5BL171-173, and 5BL186), and an overlook/lithic reduction site (5BL174) known in the upper Coney Creek valley and adjacent uplands. Communal game-drive hunting at 5GA55 and 5BL97 were the valley's main attractions, with hunting and plant-food collection on the valley floor as secondary activities. Five cultural complexes were identified in the surface collections from these sites. At 5BL96, three components with distinctive projectile points were seen. One component, with stemmed-indented base points, was interpreted as an Early Archaic type and used by Benedict (1990) in support of his Fourth of July hypothesis of McKean evolving in the mountains during the Altithermal and spreading onto the plains at the onset of the mid-Holocene glaciation. Site 5BL186 had one lanceolate point, weakly-parallel oblique-flaked, suggesting the Early or Middle Archaic period, and made of Dakota orthoquartzite.

Numerous game drive systems are known in the Continental Divide area between Boulder and Middle Park. More than 50 game drives had been recorded by the early 1990s. All are located in the northern portion of the Front Range, where the Continental Divide is offset eastward by the Middle Park basin (Benedict 1992:4). Only four are in RMNP; the remainder are in the Indian Peaks Wilderness Area. Two of the former sites are the Flattop Mountain (5LR6) and Trail Ridge (5LR15) game drives.

Trail Ridge Game Drive Site (5LR15). The site is located at the east end of Trail Ridge, and is composed of converging drive line walls designed to gather animals and move them downwind to a tundra saddle where they could be dispatched by hunters. The drive line system includes three low stone walls and five circular or semicircular blinds. Radiocarbon age estimates of 4590 ± 60 B.P. for Blind 5 and 2610 ± 60 B.P. (2-sigma range of 3506-3096 cal B.C. and 844-746 cal B.C.), respectively) for Blind 3 place them in the Early and Late Archaic periods. There is evidence that the site may have been used earlier; Jack Moomaw, an early park ranger, reported collecting a "Yuma" point from the site. Also, it appears that one of the walls was repaired during the subsequent period as well. Benedict (1996) estimates that 15-20 people could operate the drive and theorizes that elk were the likely quarry.

There are no radiocarbon-dated Early Archaic sites in either North Park or South Park. A survey by Lischka et al. (1980; 1983) provides the most comprehensive information about Archaic occupation of North Park. In an inventory of over 10,000 ha (25,000 acres), investigators found 151 prehistoric sites and 322 isolated finds. Based on surface artifacts, Early Archaic components are present at 13 multicomponent and three single-component sites. The Early Archaic diagnostic artifacts are all large, laterally notched dart points with both convex and concave bases that variously resemble points types of the Mount Albion and Magic Mountain complexes. Two are also considered comparable to types found at the Hawken site in the Wyoming Black Hills (Frison et al. 1976). Analysis of survey results led to the hypothesis that base camps in North Park are located in areas of high-density vegetal resources, and limited activity sites are found in areas with low-density vegetal resources. Lischka et al. (1980:239) also suggested that a perceived emphasis on small game during the period may possibly be correlated to

reductions in big game herds during the Altithermal. Additional inventories in the North Park area have also yielded Mount Albion (Guthrie 1980) and Hawken points (Overturf 1992), and a point identified as Northern Side-notched was found at a stone circle site (Burchett and Tate 1985).

In South Park, Guthrie et al. (1984) reported that an early survey yielded a type MM 4 projectile point in a project area near Fairplay (Metcalf 1979). An inventory of Forest Service land in Park County revealed artifacts representing all three Archaic periods, including one that was similar to a Mount Albion or MM 3 (Noisat 1983). A recent inventory yielded artifacts ranging from late a Paleoindian point fragment to a historic-era metal point. Included was a large, corner-notched dart point resembling a Hawken type (Harrison and Tate 1998a).

Although absolute-dated sites are lacking for the Early Archaic period in the large mountain parks drained by the North and South Platte rivers, there is a relative abundance of dated sites for the period in Middle Park. For example, monitoring for a road-widening project near Kremmling revealed several hearths in the road cut at previously recorded site 5GA1190. Three of the hearths produced C-14 age estimates of 6640 $\pm$ 120 B.P., 6960 $\pm$ 80 B.P., and 7040 $\pm$ 70 B.P., (2-sigma ranges of 5706-5317 cal B.C., 5964-5632 cal B.C., and 5985-5715 cal B.C.),respectively. A contracting stemmed projectile point was found in direct association with the youngest feature (Harrison 1998). It is likely that the higher known frequency of Archaic sites in and near Middle Park results in large part because the park is in the upper Colorado River drainage area, on a major transportation route between points farther west and the Front Range, but sampling bias and a lack of excavated sites are no doubt also factors in the low number of known Early Archaic sites in North and South parks.

Summary and Conclusions

The number of dated Early Archaic sites on the plains has increased since Eighmy's (1984) context was written. That number, however, is still very low. Sites known presently include three open camps and a bison kill that probably dates to this or the following period. Whether this paucity of sites results from a lack of occupation on the plains during the Altithermal, sampling bias, or geological processes is not known, but undisputed is the fact that the area has been historically, and continues to be, undersurveyed.

In the hogbacks/foothills, there is evidence for Early Archaic occupations at 14 dated sites, all open and sheltered campsites. The Early Archaic remains at these sites, however, are sparse; often only charcoal or a single hearth and a few flakes are found. An exception is Dancing Pants Shelter (Liestman and Kranzush 1987) where three hearths were dated to the period. Significant, however, is the knowledge of only three storage features (cists) in the period. Two cists found at LodaisKa contained plant remains, and there was sparse evidence for maize (Irwin and Irwin 1959). Also, the only known burial from the period was found at the Crescent Rockshelter site (Finnegan and Kilgore 1997; Adkins 1997).

Seven sites in the mountains of the Front Range date to the period, including the Flattop Mountain game drive, which has a transitional Early Archaic/Middle Archaic age range. One of these sites, Hungry Whistler, is a game drive and butchering site with an abundance of Mount Albion projectile points (Benedict and Olson 1978). Trail Ridge is also a game drive site, with both Early and Late Archaic occupations (Benedict 1996). The remainder are hunting camps, some of which have evidence for secondary butchering. These sites typically contained either

hearths or remnant charcoal for dating, and often diagnostic projectile points in addition to other flaked lithic artifacts and some ground stone. It is from studies at the Hungry Whistler and 5BL70 sites that (Benedict and Olson 1978) defined the Mountain Albion Complex. Based on lithic artifact materials, the authors proposed that these were people who followed an up/down or piston engine pattern of seasonal transhumance, traveling up to the Continental Divide country for hunting and gathering in the late summer and fall, returning to their base camps in the hogbacks/foothills on the east slope of the Front Range for the winter. From studies in the Coney Creek valley, a second model developed, which Benedict (1990) postulates was in effect for 5,700 years. According to Benedict (1990) the inferred functions of the sites, their distribution, and the lithic materials present suggest that people using this area generally arrived from the west during an annual "grand circuit," arriving late in summer or fall en route to winter base camps either to the east or west but most likely in the eastern foothills. He concludes that the communal game drive hunting on the Divide at 5GA55 and between Coney Creek and the Sawtooth drainages at 5BL97 were the primary attractions (Benedict 1990).

Middle Archaic Period (5000 B.P.-3000 B.P.)

During the Middle Archaic period, the numbers of sites generally increase. The most dramatic increase was on the plains, as might be anticipated, following the end of the Altithermal climatic episode. However, there are fewer absolute dated-occupations in the mountains than in the preceding period. Figure 5-5 shows the locations of Middle Archaic sites discussed below.

Plains

When Eighmy's (1984) prehistoric context was written, just two absolute-dated Middle Archaic sites were known on the plains of northeastern Colorado: Dipper Gap (Metcalf 1974) and the Witkin Burial (Swedlund and Goodman 1966), the latter dating to the Middle Archaic-Late Archaic transition. At that time, Eighmy noted that even nonabsolute-dated Middle Archaic sites and components were relatively rare. They included site 5WL40 (Wood 1967), Wilbur Thomas Shelter (Breternitz 1971b), two components reported by Halasi and Huse (1978), and the Bijou Creek and 5MR338 sites, originally reported by Greiser (1980). Additionally, six sites were tentatively assigned to the Archaic stage on the basis of surface finds. Eighmy (1984) also mentioned site 5WL48. The site had been tested by Lutz (1974), who noted a general Archaic component beneath the Woodland occupation that was the subject of his investigation. Since 1984, several additional Middle Archaic sites or components have been investigated and dated, including the Archaic occupational levels at 5WL48 (Jepson et al. 1994).

Dipper Gap (5LO101). The site is a stratified camp found atop a butte that forms the southern boundary of Dipper Valley. The butte, which lies in the area Pawnee Creek in northeastern Colorado, is just south of the escarpments that divide the High Plains from the Colorado Piedmont. The site was excavated by the CSU-Northeastern Junior College (NJC) field school in 1972. Dipper Gap consists of three localities in a long crack in the butte's caprock and an adjacent open area. These were designated Localities I-III. The principal occupations occurred in Locality I in the caprock crack. Four archaeological occupation zones. Zones A and B denote Late Prehistoric occupations (Middle Ceramic and Early Ceramic, respectively). Zone C occupations are of Late Archaic age, and Zone D was occupied during the Middle Archaic period. Charcoal samples from

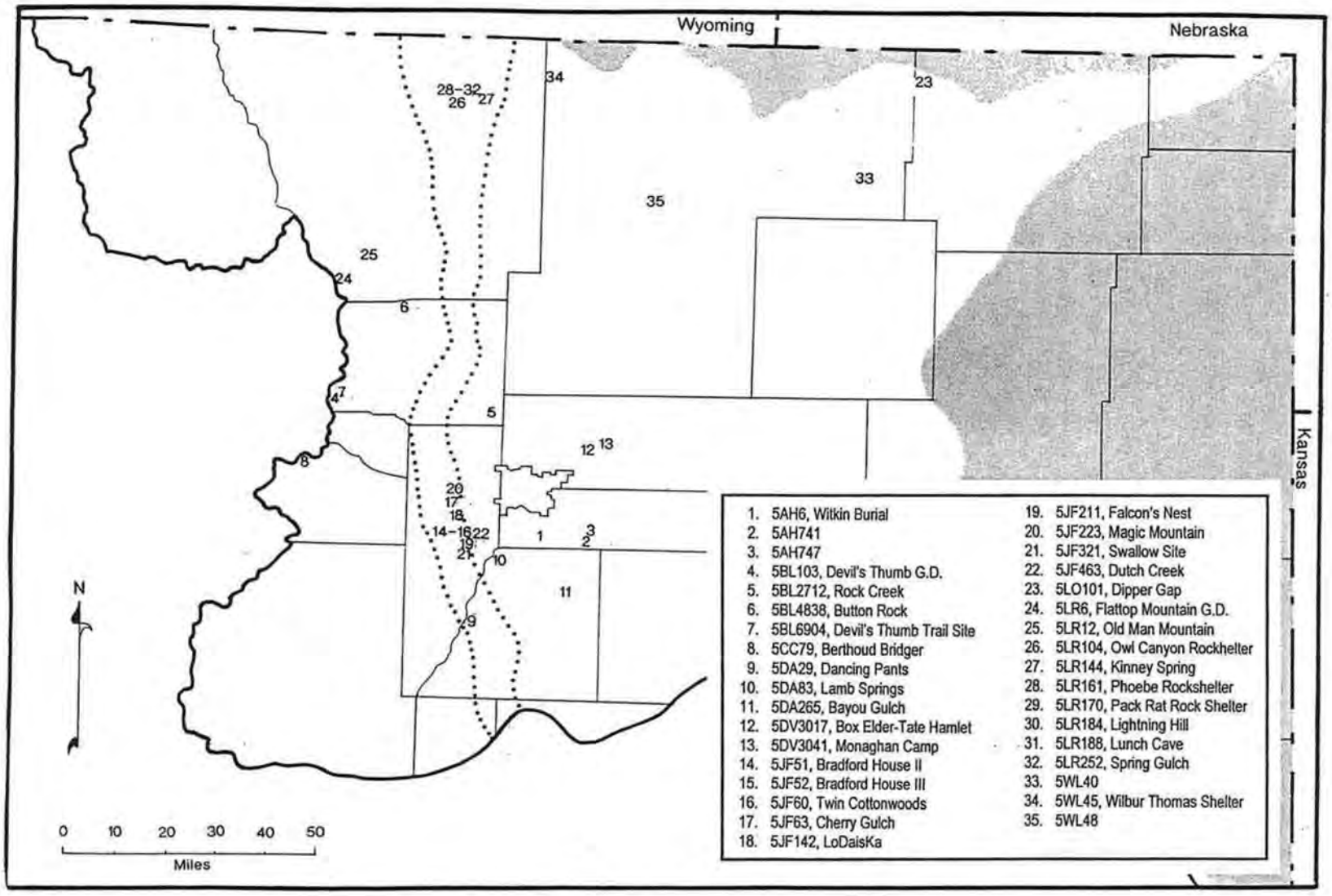

Figure 5-5. Locations of Middle Archaic sites.

Locality I Zone D returned radiocarbon age estimates of 3180 ± 90 B.P. for Feature 16, 3410 ± 90 B.P. for Feature 5, and 3520 ± 85 B.P. for Feature 10 (2 sigma ranges of 1672-1219 cal B.C.; 1928-1510 cal B.C.; and 2113-1624 cal B.C., respectively). Fifteen of the site's 21 hearths were found in Zone D. Most are unpatterned concentrations of sandstone slabs and cobbles or unlined rock-filled basins. The vast majority of debitage and tools are of Flattop chert, the source of which is 19 km (12 mi) from the site. Few cores were found, leading to the conclusion that primary reduction occurred elsewhere. The broad variety of lithic tools present included abundant projectile points, knives, and scrapers, as well as lesser amounts of drills, gravers, and perforators. Ground stone at the site included manos, metates, shaft abraders, grooved cobbles, and hammerstones. Bone artifacts, all from the lower occupational levels, were represented by three awls, three scraping tools, a bird bone bead, and incised gaming pieces. The tools were fashioned from bison, pronghorn, and canid bone. Projectile points in Zone D included a single Group 1 specimen, a Duncan point from the McKean complex and 54 specimens representing Groups 2a-b and 3, all Hanna types. No points of the McKean lanceolate type were found at Dipper Gap (see Wheeler 1952, 1957 for discussion of McKean Complex projectile point attributes). Projectile point Groups 4 and 5, considered equivalent to those of the Mountain Complex at Wilbur Thomas Shelter (Loebbers 1971; Grady 1971) and other sites were found in Zone D along with McKean specimens. Based on evidence from several sites in the region, the author has suggested that the two complexes became integrated about 3500 B.P. in and near the foothills (Metcalf 1974).

Site 5WL40. This is a sheltered camp, one of three small south-facing rockshelters situated in a low group of Ogallala Formation outcrops in West Stoneham Pasture in the Pawnee Creek area. This site has the only Middle Archaic component of 16 sites excavated in the 1960s by J. J. Wood of CU. Although the site was not dated by absolute methods, the author found a complete Hanna point and a stemmed, concave-base fragment of another point, along with an ovate blade fragment, end scraper and fragment, retouched flake, and unifacially ground mano. Debitage at the site was petrified wood, unusual for the area (Wood 1967).

Wilbur Thomas Shelter (5WL45). Middle Archaic occupations at this site are characterized by the presence of McKean Complex artifacts, although projectile points of the Mountain complex continued to be represented in the lower McKean levels (Zimmerman 1971), just as similar points continue from the levels of the Magic Mountain complex into those of the Apex complex levels at Magic Mountain (Irwin-Williams and Irwin 1966). Loebbers (1971) divided the McKean levels at the site into upper and lower levels for comparison with Mulloy's (1954) typological categories. He found that the long, lanceolate blades and stemmed Duncan points with deeply notched bases were identical to those from the McKean site. Accompanying these were plano-convex, snub-nosed end scrapers, ovoid to triangular knives or scrapers, and spokeshaves, as well as utilized flakes. For the upper level, the projectile points were again very similar to those from McKean and included triangular unnotched and Hanna types, as well as corner- and side-notched types. However, mixing was evident; Woodland points were found even in the lower level.

Site 5WL48. The site is a large camp located on and in a semistabilized dune overlooking the South Platte River. The site was originally investigated by the UNC field school in 1973 and 1974. At that time, Lutz (1974) examined a "Woodland" occupation that included a secondary burial. He noted, however, that an earlier occupation lay beneath the Early Ceramic occupation in Locality II. Subsurface testing for a later highway project was conducted in parts of the site not previously investigated (Jepson et al. 1994). The results of the effort were somewhat meager, because much of the site had been destroyed in the interim. However, the materials gathered

indicated the presence of two or possibly three cultural components. Samples of fill from Feature 23, one of four hearths were submitted for radiocarbon dating and returned the following age estimate: 3230 ± 80 B.P. (2-sigma range of 1681-1315 cal B.C.). Artifacts diagnostic of the Middle Archaic period are represented at the site by Duncan points. However, most of the materials recovered by the highway project are associated with Late Archaic occupations (Jepson et al. 1994).

Numerous inventories in northeastern Colorado have yielded artifacts diagnostic of Middle Archaic occupation, in most instances identified as McKean complex, and occasionally simply as stemmed, indented-base points. See, for example, Davis and Cassells (1980), Angulski (1982), Burgess and Grant (1982), Gleichman (1988), Brechtel (1989), and Barnes (1991).

Surveys at the Denver International Airport and Rocky Mountain Arsenal resulted in the recovery of artifacts diagnostic of the Middle Archaic period. These sites include 5DV3048, with a corner-notched point that resembled a type MM 8 and a stemmed point similar to a type MM 19 from Magic Mountain (Irwin-Williams and Irwin (1966). Two Hanna-type projectile points were also recovered in the inventories (Tate et al. 1989a; Mutaw and Tate 1992; Clark, B. J. [ed] 1997). Data recovery efforts at two other sites at Denver International Airport, Monaghan Camp and Box Elder-Tate Hamlet (Tucker 1990; Tucker et al. 1992) also provided evidence for occupation during Middle Archaic times.

Monaghan Camp (5DV3041). Three activity areas were found at the site, one of which reflects occupation during the Early Archaic period, and one of which represents a longer or more intense occupation during the Middle Archaic period. Within these latter activity area is a group of hearths, charcoal from one of which, Feature A, returned a radiocarbon age estimate of 3690 ± 130 B.P. (2462-1699 cal B.C.). Within this basin-shaped, slab-lined hearth, two goosefoot seeds, saltbush charcoal, and highly fragmented large mammal bones, probably deer or pronghorn, were found. No artifacts diagnostic of the period were found. The site is seen as a short-term camp visited during the course of seasonal rounds (Tucker 1990).

Box Elder-Tate Hamlet (5DV3017). The site is a large open camp best known for relatively intense occupations during the Early and Middle Ceramic periods, a time when its inhabitants constructed and used two small pithouses at the site. There is also, however, evidence for a less intense, smaller Middle Archaic occupation, represented in features P and Q, hearths. Feature P evidences two use episodes; a charcoal sample from the older episode returned a radiocarbon age estimate of 3520 ± 130 B.P. (2-sigma range of 2194-1517 cal B.C.). The associated materials included saltbush charcoal and a charred rose seed, and abundant faunal bone (166 charred fragments and 28 uncharred). Faunal remains represented were jack rabbit, and both large and small mammals. The second use episode was apparently excavated into a midden, the origin of which is believed to derive from a feature or features of Late Archaic or earlier age that were once located west of Feature P, possibly where Feature 1, the pithouse, was found. This suggests that the pithouse may actually have been dug during Middle Archaic or earlier times, though no evidence remains. Feature Q was also assigned to a Middle Archaic occupation based on its proximity to Feature P, the morphological similarity of the two circular basins, and the similarity of contents. Feature Q also contained a large amount of faunal bone, although a higher percentage was uncharred. There were no artifacts diagnostic of the period associated with the features, both of which are considered the focus of faunal processing activities (Tucker et al. 1992).

Rock Creek Site (BL2712). Although this site produced only meager information to document its Early Archaic occupation, there are at least two Middle Archaic components. The site's earliest Middle Archaic component was found adjacent to and just above the Early Archaic Feature 12, and there is a younger component in the southern portion of the site. A second radiocarbon age estimate of 5690 ± 64 B.P. (2-sigma range of 4712-4363 cal B.C.) was obtained from shrub charcoal that grew within the fill of a Feature 34, a shallow basin-shaped hearth. The shrub later burned, providing a post-occupational date. The feature was located about a meter from the top of the middle of three alluviums found on Rock Creek, deposition of which dates from ca. 9000-4500 B.P. Charcoal samples from two hearths in the southern part of the site, Features 20 and 22, which were located in the youngest alluvial fill, returned radiocarbon age estimates of 3120 ± 190 B.P. and 3000 ± 190 B.P. (2-sigma ranges of 2869-848 cal B.C. and 1677-802 cal B.C., respectively) for the younger Middle Archaic component. Another basin-shaped hearth (Feature 19) and a probable hearth dump (Feature 18), are also considered part of the younger Middle Archaic manifestation, based on their relative stratigraphic position. Nine stemmed, indented-base points and a stemmed, indented-base drill have been recovered from the two Middle Archaic components. One of the points from the older occupation is Kremmling chert; the remainder are of local materials. Unusual for Middle Archaic points is the fact that all haft elements from both components are ground (Frison 1993). Of the remaining tool types, bifaces dominate the assemblage, followed by modified flakes. Other tool types are only minimally represented and cores are rare. Among the miscellaneous ground or polished stone collection, there is an atlatl weight of Boulder Creek granodiorite. Debitage at the site is characterized by small flakes representing the final stages of lithic reduction. Windy Ridge quartzite, Kremmling chert, and Parker petrified wood (Dawson silicified wood) are represented in the debitage; for the Archaic, petrified wood is most common. Ground stone is highly fragmented and usually burned. Directly above the Early Archaic hearth, a complete loaf-shaped mano/hammer was recovered. Not surprisingly, the material sources are stream cobbles and the hogbacks to the west. Charred pigweed, goosefoot, bulrush, and cocklebur seeds were found in the hearths, all economic species. Less than 33 percent of the bone during the Archaic periods is from medium-large animals; there appeared to be more emphasis on small mammals, including prairie dogs, and birds. The majority of bone at the site consisted of long bone shafts; 80 percent of all bone found was fragments no more than 2 cm in diameter, most of it unburned, indicating probable grease manufacturing activities. Fourteen percent of the Archaic bone was burned or calcined, indicating relatively important marrow extraction activities. Gleichman et al. (1995); Karhu et al. (1997); Gleichman and Karhu (1997) have concluded that while the age of the earliest Middle Archaic component is unusual for plains sites, it is contemporaneous with several of the high altitude sites (i.e., Hungry Whistler, Coney Lake, Fourth of July Valley.

Site 5AH741. This site is an open camp, is situated on a south-facing slope overlooking a small arroyo that is found immediately south of Piney Creek on the plains of western Arapahoe County. The site was investigated in several phases from 1993 to 1996 by Metcalf Archaeological Consultants in conjunction with planned construction of the E-470 highway (Shields 1993). Excavations at the site revealed occupations dating from Middle Archaic times and the end of the Late Archaic period. Charcoal samples from the Middle Archaic occupational levels yielded radiocarbon age estimates of 3620 ± 70 B.P. for Feature 8, 4080 ± 60 B.P. from the bottom of Level 9, 4330 ± 110 B.P. for Feature 2 (2-sigma ranges of 2180-1754 cal B.C.; 2874-2463 cal B.C.; and 3340-2618 cal B.C., respectively). In addition to hundreds of flakes, the assemblage includes 27 stone tools, of which there are bifaces and flaked tools, ground stone, and cores. A projectile point from the site is comparable to type MM 19 from the Apex complex of Zone D at

Magic Mountain (Irwin-Williams and Irwin 1966). Limited faunal remains at the site suggest that bison may have been processed there. Combined pollen and starch washes of ground stone implements indicate that grass seeds or starchy roots were ground. Macrofloral evidence from features at the site suggests that cactus pads and bulrush seeds were processed there, and ponderosa pine and alder were used for fuel. The camp served primarily for vegetal gathering and processing from spring through fall in Middle Archaic times, with secondary activities of lithic procurement and reduction, and faunal processing (Graham 1998).

Site 5AH747). The site, an open camp, is another site investigated by Metcalf Archaeological Consultants in conjunction with the E-470 highway project. The site was found eroding from a small arroyo found in a relict stand of ponderosa pine. The buried site manifestation consisted of a hearth, filled with dark charcoal-stained soil with oxidized sandstone and quartzite cobbles in an around it. Charcoal from the hearth returned a radiocarbon age of 4260 $\pm$ 60 B.P. (2-sigma range of 3017-2618 cal B.C.). The few associated artifacts were all flakes of Parker petrified wood (Dawson silicified wood) (Graham 1996).

Bayou Gulch Site (DA265). This is a large, open camp located on the northern edge of the Palmer Divide southeast of Denver, near the confluence of Bayou Gulch with Cherry Creek. The site was identified in 1977, during a Colorado Department of Highways cultural resources survey conducted in preparation of an expansion of Colorado Highway 83 (Parker Road) (Miller and Fiero 1977). This inventory identified 12 prehistoric sites, five of which were subsequently tested. Among these was Bayou Gulch. In 1979, this site, along with the Kinney Creek Site (5DA269) was subjected to further excavation, the results of which have been the subject of several reports y (Amini-Minor 1983; Ellwood 1987; and Gilmore 1991b). Gilmore (1991b) found that even though the most intensive occupation of the site occurred during the Early and early Middle Ceramic periods, there was evidence also for Archaic occupations. Two radiocarbon age estimates were obtained for use of the site during this time. The older estimate is 3410 $\pm$ 70 B.P.(2-sigma range of 1885-1520 cal B.C.), derived from charcoal in Feature 14, a hearth. The earliest diagnostic artifact from the site, however, predates the radiocarbon age estimates. The artifact is an Early Archaic projectile point of Magic Mountain type MM 4 (Irwin-Williams and Irwin 1966). The point was recovered from an undisturbed context in the Altithermal Stratum 1, Level 6. The remaining Archaic materials were analyzed as a single unit. Of 38 features at the site, 32 were hearths or related features; 11 of the hearths are associated with Archaic occupations at the site. The majority of these are basins without rocks and rock or charcoal concentrations. The majority of flaked lithics recovered were petrified wood (83 percent of the Archaic materials), followed by quartzite. The remainder included small amounts of rhyolite, chert, chalcedony, quartz, and quartz crystal, all locally available. Gilmore (1991b) reported numerous bifaces, relatively few drills, and a high frequency of expedient flake tools. The nature of the less formal scrapers is seen as possibly a function of the proximity of the site to local petrified wood sources or short-term camps, or both; the higher frequency of this tool type in the Archaic as compared to the Ceramic components of the flaked lithic assemblage, however, was interpreted as evidence for a greater relative importance placed on extractive subsistence activities. The ground stone supports this conclusion. Manos, metates, grooved stones, and paint palettes were found. The large number of manos and the variety of types observed in the Archaic levels were attributed to intensive grinding activities or a diversity of materials processed, or both. The presence of a bone bead suggests a longer term habitation (Roper 1990, cited in Gilmore 1991b).

Surveys of areas in the vicinity of Bayou Gulch have also resulted in the identification of sites with artifacts from the Archaic. Numerous of these sites along the ridges adjacent to Cherry Creek are procurement locales for the local Parker petrified wood, the source of which is the Dawson Arkose bedrock in the area. For example, a survey of the 1,000 ha (2,500 acre) Betts Ranch revealed 102 prehistoric sites. Although there were a few open camps, the majority of the sites were open lithic sites, where petrified wood could be procured from naturally eroding deposits and where the beginning stages of lithic reduction occurred (Tate et al. 1989b).

Though burial sites of the Early Ceramic (Woodland) period are not uncommon on the plains, Archaic burials are a rarity. Several burials with Late Archaic/Early Ceramic transitional dates have traditionally been considered Woodland in affiliation, although there is little to distinguish flexed burials of the Late Prehistoric from the Archaic, particularly in the absence of burial goods. However, the Witkin Burial (5AH6) is clearly of Archaic age. Immediately north of the Colorado border in the Nebraska panhandle, the Sidney Burial (25CN55) of Middle Archaic affiliation has also been investigated. This burial sheds much needed light on burial practices of the time.

Witkin Burial (5AH6). This interment was recovered by the Arapahoe County Coroner in 1966 and subsequently analyzed by the personnel at CU after the remains were exposed by construction activities for a housing development. The skeleton was found flexed, facing southward, in what had originally probably been a sitting position, but at the time of disinterment was found midway between sitting and lying. Found with the skeleton were two lithic bifaces and two bone implements, a scraper and an uncompleted awl, both of mule deer. University students who visited the site found the burial pit in the southwest corner of a house foundation. The burial was a fairly complete specimen, a male approximately 25-35 years of age, with no evidence of intentional skull deformation. A radiocarbon age estimate of 3190 $\pm$ 80 B.P. (2-sigma range of 1627-1264 cal B.C.) was derived from a bone sample. Noting that Wedel (1961) had found shell and bone ornaments, and that pottery was a be common burial accompaniment with Woodland burials, Swedlund and Goodman (1966) prior to dating the remains, believed that the burial might be related to others of early Plains Woodland affiliation because of its resemblance to flexed burials at Bisterfeldt Potato Cellar site (Mattes 1965:59), Level 2 of the Hazeltine Heights site (Buckles et al. 1963:29), and the Hutcheson Burial site (Wade 1966).

Sidney Burial (25CN55). This burial site is located on the High Plains in the North Platte River basin near the town of Sidney, Nebraska, a few miles north of the Colorado border. The burial was discovered eroding from a road cut with debitage, bison bone, and fire-cracked rock above it. Immediately over the burial in the same paleosol as the human skeletal material were several large tabular pieces of local chalky rock, which may have capped the burial pit. Here, investigators recovered the fragmentary remains of a young adult male and an infant of indeterminate sex. The adult had been placed on his left side with his legs partially flexed against his chest. Only the left malar of the infant was found. Burial goods included a notched biface, five small amazonite pendants (most exhibiting red ocher staining), a fragmented turtle carapace, several bird bones and other vertebrate remains, and freshwater mussel fragments. The burial is important because the associated cultural materials represent the earliest regional examples of ornamentation in direct association with a burial. Human bone samples were submitted for radiocarbon dating. Using the Accelerator Mass Spectrometry (AMS) method, the bone's collagen content was assayed. The derived radiocarbon age is 3710 $\pm$ 60 B.P. (2-sigma range of 2288-2466 cal B.C.), places the burial in the early portion of the Middle Archaic period. Carlson et al. (1999) have tentatively

identified the cultural affiliation as the Northern Plains Oxbow complex, primarily on the basis of the use of red ocher. Interestingly, the nearest primary source of amazonite is in the Pikes Peak region of Colorado, which attests to either trade or travel. Amazonite is also found in nodules along the Palmer Divide to the north of Colorado Springs and is known from prehistoric cultural occupations in both the Arkansas and Platte river basins in Colorado. A possible pendant was found at Lehman Cave in the Palmer Divide area, where evidence for occupations from Middle Archaic (McKean complex) through the Late Ceramic or Protohistoric periods were found (Lyons and Johnson 1994). It was also found in Early Ceramic deposits at Bradford House III (Johnson and Lyons 1997b) west of Denver, and an amazonite pendant similar to those from the Sidney Burial was found in the Aurora Burial, also dating to Early Ceramic times (Guthrie 1982).

Hogbacks/Foothills

Several multicomponent sites in the foothills northwest of Fort Collins have yielded evidence for Middle Archaic occupation. The sites, all of which contain cultural materials diagnostic of the McKean Complex, include Spring Gulch (Kainer 1976), Kinney Spring (Morris et al. 1985), Lightning Hill (Morris and Marcotte 1977), Phoebe Rockshelter (Thompson 1986), Pack Rat Rockshelter (Morris et al. 1985), Lunch Cave (Morris, personal communication 1999), and Owl Canyon Rockshelter (Burgess 1981). Numerous sites in the hogbacks/foothills west of Denver also date to the period. The occupations represented at these sites are often manifested by a continuation of type MM 3 points in the period, as well as by McKean artifacts. Sites in the hogbacks/foothills include several not discussed previously, such as Bradford House II and Bradford House III (Richardson 1974; Medina 1974, 1975; Johnson and Lyons 1997a, 1997b), and Falcon's Nest (Adkins 1993), all located on the Ken-Caryl Ranch, and Dutch Creek (Jepson and Hand 1994) located immediately east of the ranch. Several others with evidence for Early Archaic occupations that have been mentioned previously.

Spring Gulch Site (5LR252). The site is a multicomponent open camp situated on two terraces in the bottom of Spring Gulch. Located in the foothills of the Laramie Mountains north of the Cache la Poudre River, the site was excavated by students in the CSU archaeological field school from 1973 to 1975. Although three localities were identified at the site, most of the cultural materials were found in Locality I, where deposits were at least one meter thick. At Locality I, the lower portion of Level III and Levels IV and V contain materials diagnostic of late Early Archaic occupation. The oldest radiocarbon age estimates for occupations at the site are 3855 $\pm$ 350 (2-sigma range of 3341-1417 cal B.C.) for the bottom of Level IV and 3700 $\pm$ 105 (2-sigma range of 2453-1771 cal B.C.) for the top of Level V, possibly reflecting some mixing. However, in these levels, the investigator found projectile points designated Types 10, 16-20 and 25-30. The earlier series resemble points commonly attributed to the Early Archaic period. Types 10, 16, and 19, for example, were considered by Kainer (1976) to be similar to points of the Magic Mountain complex (Irwin-Williams and Irwin 1966), LoDaisKa complex D (Irwin and Irwin 1959), and the Mountain complex (Grady 1971). Type 16 projectile points from the site were also compared by Kainer (1976) to the Altithermal Side-notched type (Frison et al. 1976), known from sites such as Mummy Cave, Sorenson IV, and Hawken. However, at Spring Gulch, these types were found in general association with points of the McKean complex sequence in Levels IV and V (Kainer 1976), such as they were at Dipper Gap (Metcalf 1974).

Middle Archaic point types at the site include Types 25-30. Those of the McKean sequence are Types 27-30 at the Spring Gulch site. The site's Type 25 point, a large side-notched

artifact with concave base, was considered similar to Mallory points found at the Scoggins site, a bison trap in southern Wyoming (Lobdell 1974) and at the Signal Butte site (Wormington and Forbis 1965) in general association with McKean artifacts. Spring Gulch contained numerous hearths and an abundance of debitage and lithic tools, mostly of gray quartzite available locally in exposures of Morrison Formation. In addition to projectile points, bifaces, choppers, scrapers, spokeshaves, drills, gravers, burins, and utilized flakes, there were numerous cores, mostly discoidal, and ground stone and bone tools. Included were several awls or needles, probably all from mule deer, and bone scrapers. All were found in Levels IV and V. Throughout all levels, faunal bone was dominated by large mammal remains; bison and mule deer were the prevalent species identified. Pronghorn remains were not found. Other fauna represented included jack rabbit, cottontail rabbit, possible bobcat, pocket gopher, vole, wood rat, red-tailed hawk, and western painted turtle, as well as freshwater clam. Based on the bone at the site, all of the large mammals were adults, and game animals were killed and butchered elsewhere. It is suggested that these animals were quartered at the kill sites and the thoracic and pelvic appendages, with their attached muscles, were transported into the camp. Plant remains were almost absent at the site (flotation analysis of hearth fill had not been completed at the time of the report), but charred Goosefoot seeds were found near the bottom of Level IV at the same depth as a hearth. Kainer (1976) found the artifact assemblage from Levels IV and V comparable to that from Zone D at Dipper Gap (Metcalf 1974), except that no bone beads, incised gaming pieces, shaft smoothers, or paint nodules were found at Spring Gulch.

Kinney Spring Site (5LR144). The site is an open camp with Early Archaic through Early Ceramic components. The site contained a few hearths with associated points diagnostic of Middle Archaic occupations. Charcoal samples from general excavation levels and the creek bank yielded the following radiocarbon age estimates for the occupations of the period: 3110 $\pm$ 130 B.P.; 3250 $\pm$ 80 B.P.; 3800 $\pm$ 70 B.P.; and 3950 $\pm$ 150 B.P. (2-sigma ranges of 1674-999 cal B.C.; 1731-1324 cal B.C.; 2460-1984 cal B.C.; and 2884-1980 cal B.C., respectively) . Diagnostic artifacts associates with the Middle Archaic levels included four McKean complex projectile points and a single Mallory type point (Morris et al. 1985).

Lightning Hill Site (5LR284). At this multicomponent site, small isolated groups of Middle and Late Archaic projectile points represent at least four occupations. The points were found in association with fire-cracked rock hearths similar to those described for the Early Ceramic site occupations. Two human burials, one primary and one secondary, were found in a disturbed stratigraphic context. Both are likely associated with Early Ceramic occupations at the site (Morris and Marcotte 1977).

Phoebe Rockshelter (5LR161). At this site, a west-facing sheltered camp near the Spring Gulch, the largest temporally diagnostic unit is the McKean Complex. Radiocarbon age estimates from the top and bottom of a single, reused large hearth, Feature 14, are 3570 $\pm$ 60 B.P. (2-sigma range of 2114-1742 cal B.C.) and 3890 $\pm$ 60 (2-sigma range of 2554-2145 cal B.C.). In Natural Stratum 3, diagnostic artifacts included a hafted dart or knife associated with the Mountain complex (Benedict 1981) or McKean, a lanceolate projectile point, and a Mountain complex knife, indicative of Early and Middle Archaic occupations. In Stratum 4, investigators found a reworked Duncan point and two Hanna points all of green-gray Morrison quartzite. Modified bone in the artifact assemblage includes an elk or bison rib, freshwater mussel shell fragments, and the long bone shaft of an unidentified mammal (Thompson 1986; Morris et al. 1985).

Pack Rat Rockshelter (5LR170). This site is described as two shelters overlooking Spring Gulch. The site has evidence for Early through Late Archaic occupations; however, the site's cultural materials are predominantly of Middle Archaic origin. Although radiocarbon age estimates from the site date only the later occupations, the site yielded 19 McKean projectile points, 10 of which are Duncan and two of which are Hanna, as well as one Mallory point. The Middle Archaic artifacts were found overlying a few others tentatively identified as the remains of the Mountain complex. Projectile points and other lithic tools at the site were found in association with ground stone, bone awls, and fleshing tools. Quartzite tools and flakes comprised more than 90 percent of the flaked lithic assemblage. Springs and a quartzite quarry are located nearby. Morris et al. (1981, 1985) have noted that there are several unexcavated McKean sites in Larimer and Weld counties, known from surface inventories. These sites include 5LR156, 5LR205 (Spring Canyon), 5LR239, 5LR251, 5LR262, 5WL689, 5WL690, and 5WL701.

Lunch Cave (5LR288). This is a multicomponent camp with evidence for Middle Archaic and Late Prehistoric Dismal River) occupations. A charcoal sample from a hearth at the site, Feature 2, returned a radiocarbon age estimate of 3085 $\pm$ 60 B.P. (2-sigma range of 2492-1135 cal B.C.). Associated with the hearth was a Hanna point (Elizabeth Ann Morris, personal communication 1999).

Owl Canyon Rockshelter (5LR104). Although this site is primarily an Early Ceramic campsite, hearths in Stratum 4 are interpreted by the Burgess (1981) to be Middle Archaic. Associated with Stratum 4 are Duncan and Hanna projectile points. As in later occupations, the faunal assemblage from the stratum, which the author concedes may be mixed, include deer, coyote, and rabbit (Burgess 1981).

A CSU inventory in the Lykins Valley (Morris et al. 1979) yielded a Mallory Side-notched point and two fragments of Duncan points. Along the Dakota hogback northwest of Loveland, another inventory located seven sites with Duncan type dart points (Travis1988). Surveys in the foothills west of Boulder and Denver have yielded similar finds (Windmiller and Eddy 1975; Tate 1979; Chocol and Gooding 1985; Grant et al. 1996). Most of the excavated sites in the hogbacks and foothills west of Denver have also yielded evidence for Middle Archaic occupation. Included in this group of excavated sites are two that are located on the plains just east of the Dakota hogback, Lamb Spring (Stanford et al. 1981; Rancier et al. 1982) and Dutch Creek (Jepson and Hand 1994) and one, Dancing Pants (Liestman and Kranzush 1987) that is in the foothills west of the hogbacks. At some of the multicomponent sites in the group, such as Dancing Pants, the Middle Archaic components evidence the most intensive occupations present.

Lamb Spring Site (5DA83). This is a deeply stratified, multicomponent site located around an inactive spring just east of the Dakota hogback southwest of Denver. The site was sporadically occupied from possibly pre-Clovis to historic times. The site has been the subject of Smithsonian Institution investigations, first in 1961-1962 by Waldo Wedel and again in 1981 (Stanford et al. 1981; Rancier et al. 1982). The primary focus of activities at the site appears to have been the procurement of animals attracted to the location for water; there are mammoth and bison bone beds, the latter associated with Cody complex artifacts. Although no campsite was identified, disturbed and redeposited upper levels at the site contained evidence for Archaic use: type MM 3 points, as well as McKean lanceolate and Duncan specimens. Ground stone was also present.

LoDaiska Site (5JF142). Some of the cultural materials found at depths of 1.3-1.8 m (50-72 inches) at the site were defined as Complex C and found to be most comparable with the lower level McKean as described by Mulloy (1954). However, there is little, if any, stratigraphic separation between Complex C and materials of the earlier Complex D. Of those materials identified as Complex C, the most common projectile point (24 specimens), is a shouldered and stemmed indented-base Duncan type. Less representative of the complex are McKean lanceolate points, which are smaller than those from the McKean and Signal Butte sites. Also similar to the artifacts from those sites is a group of end scrapers, not found at LoDaisKa in the deeper levels. Large and well-defined stone-filled hearths were also considered by the authors to be possibly related to the McKean complex. Charcoal samples found in association with cultural materials of the complex returned radiocarbon age estimates of 3150 $\pm$ 200 B.P. and 3400 $\pm$ 200 B.P. (2-sigma ranges of 1885-868 cal B.C. and 2200-1219 cal B.C., respectively). Activities inferred for Complex C occupations at the site are hunting and gathering. Mule deer comprised 75 percent of the faunal remains; there was little evidence for bison exploitation, and the frequency of small game bone was even less than in the preceding Complex D. There were numerous metates and manos and the presence of plant remains-acorns, sedges, and chenopods-indicates grinding of edibles. The abundance of scrapers and utilized flakes suggests hide processing. Bone beads and paint stones, both hematite and limonite, were also identified with the complex and used for decorative purposes (Irwin and Irwin 1959). It is likely that Middle Archaic occupants used the site as a base of operations for some part of the year.

Magic Mountain Site (5JF223). The Apex complex replaced the Early Archaic Magic Mountain complex by ca. 5000 B.P. and extended until about 3000-2800 B.P. The Apex Complex thus correlates temporally with the Middle Archaic and early part of the Late Archaic as presently designated. Irwin-Williams and Irwin (1966) believed that the Apex complex represented a component ancestral to the Pueblo culture and that there was little cultural interaction reflected in the material culture between that at LoDaisKa, or between the Magic Mountain and Apex complexes, or the Apex and McKean complexes. However, Apex materials, found in parts of Zones E-D and in Zone C, include a variety of tools, including numerous projectile point types that are similar in appearance to those from other Middle Archaic sites in the region and several of which (MM 6-MM 17) are McKean-like (Irwin-Williams and Irwin 1966; Kalasz and Shields 1997; Eighmy 1984). A recent investigation included excavation of a test unit into Archaic deposits. A soil sample returned a radiocarbon age estimate of 3220 $\pm$ 90 B.P. (2-sigma range of 1684-1267 cal B.C.) for Zone D. Artifacts and floor samples from the Archaic deposits were subjected to blood residue analysis; importantly, four of the five samples analyzed tested positive for bison (Kalasz and Shields 1997).

Several burials have been encountered in Archaic contexts at foothills sites. At Magic Mountain (5JF223), two burials were found in archaeological Unit C, which is associated with artifactual materials of Middle to Late Archaic age. As reported by Irwin-Williams and Irwin (1966), the first burial, which was excavated by Elizabeth and Harold Huscher of the Colorado (Denver) Museum of Natural History in 1941. The remains were found in a semiflexed position beneath a cairn of sandstone slabs, some of which were metates. The second, designated Burial III by Irwin-Williams and Irwin (1966), was also found interred beneath a cairn of sandstone slabs, which included two metates. The skeletal remains were fragmentary and the individual's original position was not discernible, but the remains had been placed in a shallow, oval burial pit (Kalasz and Shields 1997).

Cherry Gulch (5JF63). Middle Archaic occupations at Cherry Gulch are documented by projectile points Types 3, 4, and 4A, and a radiocarbon age estimate. Though there is little stratigraphic separation in occupational levels at the site, the Middle Archaic occupation is somewhat separated spatially. Type 3 indented-base points, are comparable to the type Sorenson V, thought by some archaeologists to be an early McKean form (Husted 1969), but smaller. They also resemble the Magic Mountain type MM 6, without the heavy serration. Type 4 and 4A points are relatively large side-notched points, which the Nelson (1981) has compared to those of the Rio Rancho phase of central New Mexico. A bone sample recovered in the same level as the latter points returned a radiocarbon age estimate of 3460 ± 75 B.P. (2-sigma range of 1945-1529 cal B.C.) (Nelson 1981).

Dutch Creek (5JF463). This is a multicomponent camp located on both sides of a stream flood plain immediately east of the Dakota hogback. The site revealed no surface manifestation upon survey (Martin 1976). In 1985, after finding subsurface remains at the nearby Massey Draw site during monitoring of C-470 construction activities, investigators took core samples from an area south of Dutch Creek, which revealed charcoal, and obtained radiocarbon samples dating to the Late Archaic period. Subsequent investigations uncovered hearths and artifacts representing Middle Archaic, and Late Archaic/transitional Early Ceramic components (Gilmore and Baugh 1987; Gilmore 1989b; McNees 1989; Jepson and Hand 1994). Charcoal from a core sample taken in 1987 yielded a radiocarbon age of 3260 ± 80 B.P. (2-sigma range of 1734-1328 cal B.C.). Charcoal from Features 5, a shallow basin hearth, and Feature 6, a rock-filled basin hearth, returned radiocarbon dates of 4210 ± 100 (2-sigma range of 3033-2492 cal B.C.) and 4210 ± 80 (2-sigma range of 3010-2507 cal B.C.), respectively. Area 1, south of the creek, yielded bison and jack rabbit bone. Twenty pieces of burned bone, and one fragment of "deer-sized" butchered bone were recovered, all from the Middle Archaic Strata F and G. A total of 189 artifacts was recovered during the mitigation effort; materials are mainly quartzites, chalcedony, and Dawson Formation petrified wood. Based on provenience, the Middle Archaic artifact assemblage includes two or three unhafted bifaces and three retouched flakes. Two biface fragments, one uniface, a possible scraper, and a core of dark yellow-brown chert may predate the Middle Archaic. Functions of the Middle Archaic occupation are inferred to be tool finishing, possibly tool maintenance, and game processing for immediate use. Presence of upper and lower limbs of bison suggests transport from a kill site for secondary processing, including later stripping of meat and tendons, and extraction of marrow. Based on the presence of fetal bone in the faunal sample from the nearby Massey Draw site, investigators believe a spring occupation and kill may be represented. Hearth fill indicated goosefoot seeds were processed for food in late summer or fall. Jepson and Hand (1994) believe that while a broad range of activities is represented at the site, there is no evidence for annual or extended occupations. They see many similarities between this site and Massey Draw and have proposed that both may have been part of a larger resource procurement area where the overall floral and faunal potential of the larger ecozone was of paramount importance.

Bradford House III Site (5JF52). The site is a sheltered camp located at the north end of the Ken-Caryl Ranch. As with almost all of the excavated Ken-Caryl sites, Bradford House III yielded evidence for Middle Archaic occupations (Johnson and Lyons 1997b). The site has multiple occupations represented by 25 features from the Middle Archaic to Early Ceramic periods. The oldest of three radiocarbon age estimates is 4900 ± 105 B.P. (2-sigma range of 3950-3380 cal B.C.) from the lower portion of Feature 23. Based on stratigraphic position and the two other dates, Johnson and Lyons (1997b) rejected the date. Another charcoal sample returned a radiocarbon age estimate of 3810 ± 140 B.P. (2-sigma range of 2612-1789 cal B.C.) from the

upper portion Feature 23, found at a depth of 2.3-2.4 m (92-96 inches). This feature is a hearth that is near the center of a 60 cm (24 inches) thick level. Associated with this thick zone were Magic Mountain type MM 3 projectile points; a total of 22 specimens of this type were recovered. Within this same level a living floor, Feature 21, was found at a depth of 2.1-2.3 m (84-92 inches). At the base of the excavation a small cist, Feature 12, was revealed. The cist, at a depth of 3.1 m(124 inches), is a low dry-laid wall three courses high. Made of local sandstone, the feature incorporates part of the back wall of the shelter and was likely covered with the piece of schist found in pieces in its interior. There is evidence for use of several ungulate species, as well as smaller mammals and occasional birds, but primarily deer. The Archaic levels produced a wide variety of flaked lithic tools. In contrast with Bradford House II (5KF51), there were considerably more formal tools than retouched or utilized flakes (Johnson and Lyons 1997b, 1997a; Richardson 1974). While there are no radiocarbon dates for Middle Archaic occupations at either Bradford House II or Twin Cottonwoods, both located near Bradford House III, both sites produced artifactual evidence for the period.

Bradford House II (5JF51). The site is a small rockshelter located on the south end of a large rocky protuberance of Lyons Sandstone. In addition to Historic and Early Ceramic components, the site produced Middle and Late Archaic remains. The single radiocarbon age estimate for the site, 3255 $\pm$ 765 B.P. (2-sigma range of 3627 cal B.C.-A.D. 338) produced an age range that is too broad to be useful. However, the date was derived from a slab-lined hearth with associated Duncan points. In addition to Duncan points, MM 3, McKean, Hanna, and Mallory specimens were recovered. Faunal remains within the Archaic zone included 12 species. Mule deer are dominant, followed by bison and rabbit (Johnson and Lyons 1997a; Richardson 1974).

Twin Cottonwoods (5JF60). The site is a small open camp situated in a wash channel between two ridges of Lyons sandstone overlooking Dutch Creek. Ten hearths and artifacts similar to those of Bradford House II were found (Beal and Beal 1997).

Falcon's Nest (5JF211). This site is a camp sheltered by a south-facing monolith of Fountain Formation sandstone. Excavated by CAS in the mid-1970s, the site is located in the southern portion of the Ken-Caryl 1.6 km (1 mile) north of Deer Creek. At Falcon's Nest, investigators found abundant cultural materials evidencing occupations from the Middle Archaic, Late Archaic, and Early Ceramic. A charcoal sample taken at a depth of 67-70 cm (27-28 inches) from Grid C5 returned the site's earliest radiocarbon age estimate, 2760 $\pm$ 110 B.P. (2-sigma range 1251-770 cal B.C.), from the Middle-Late Archaic period. Although occupations during the Archaic periods were less intense than in the later Early Ceramic, the Archaic levels at the site produced 14 hearths and a wide variety of lithic artifacts. The site yielded 364 projectile points (of which over 100 are from Archaic levels), knives, scrapers, gravers, and choppers, in addition to abundant ground stone implements found well distributed throughout all levels. Surprisingly, for all occupational periods combined, the site yielded 329 retouched and utilized flakes, but only seven spent cores. Jasper was the most common flaked material, followed by chalcedony and quartzite. In the Archaic levels, projectile points were most commonly made of quartzite. Diagnostic artifacts in the Middle Archaic levels included type MM 3 and Duncan projectile points. Based on the analysis of faunal materials at the site, investigators have identified deer as the primary source of meat for the site's inhabitants. These bone studies indicate that bison bone was not brought in, unless it was so pulverized for grease manufacture that it was not identified (Adkins 1993:I, II:1, III, IV, VI:4-6, 60).

Swallow Site (5JF321). At the Swallow site, evidence for the Middle Archaic suggests that the occupations were fewer and more scattered than in the subsequent periods. However, there are similarities in the features, mostly hearths, and general artifact assemblage with those of the Late Archaic. Also, like the other sites at the Ken-Caryl Ranch, diagnostic artifacts for the Middle Archaic include both types MM 3 and McKean Complex projectile points. Feature 107, however, is an anomaly. A slab-lined arcuate structure, not typical of hearths found at the site, the feature was found at a depth of 2.3 cm. The feature is indicative of Middle Archaic occupation that occurred shortly after a rock fall had covered a large part of the site's living area. Several pieces of ground stone were used in the feature's construction. All show evidence of intense burning, but the precise function of the feature is unknown. Charcoal in association with Feature 107 returned a radiocarbon age estimate of 3150 + 100 B.P. (2-sigma range of 1626-1129 cal B.C.). A second Middle Archaic feature (Feature 17), is a primary flexed interment of a single individual. Charcoal found in association with the burial provided a radiocarbon age estimate of 3440 $\pm$ 90 B.P. (2-sigma range of 1964-1517 cal B.C.) (Rathbun 1991; Rathbun and Hammond 1995).

Dancing Pants Shelter (5DA29). At this site, intensive use occurred during the Middle Archaic when the earlier Mount Albion technological continuum was interrupted or superimposed by the McKean complex. Typical of this period at the site are several groups of features that include hearths and clean-out deposits (Features 10, 12, upper portion of 16, 17, 24, and 25). Found in association with these features are charcoal, ash, and occasionally fire-cracked rock, flakes, burned and unburned bone, ground stone fragments, and a few flaked lithic tools. Feature 12, for example, contained 10 large mammal bones, which are probably deer, and a variety of macroflorals. The latter included conifer, dicotyledon, and other charcoal, as well as pine and fir that were used for fuel. Also recovered from the feature were remains of pigweed, goosefoot, dandelion, grasses, and mallow, vegetal foods that were processed in the hearth. Charcoal from the feature returned a radiocarbon age of 3260 $\pm$ 100 B.P. (2-sigma range of 1746-1312 cal B.C.). In addition to the various fire features, Feature 27 probably represents two post molds that were elements of a lean-to shelter. The upper of three elements of the feature was an area of charcoal staining and oxidized gravel below which were found two distinct, round, organic-stained depressions, at the base of which was granite. The organic material in the post depressions was determined to be juniper. Charcoal from the upper stain returned a radiocarbon age estimate of 2910 $\pm$ 80 B.P. (2-sigma range of 1376-864 cal B.C.). Three McKean lanceolate points and nine Duncan-Hanna points were recovered in the excavation of the site. The lithic technology utilized two reduction techniques. No cores were recovered, and the debitage indicates that the primary technique was bifacial blank reduction as opposed to core reduction, although a few prismatic flakes were recovered. The low frequency of utilized flakes and percentage of intact cortex indicate that primary reduction occurred elsewhere and that secondary and final reduction occurred at the site, along with reworking and resharpening of tools. There is considerable evidence for thermal alteration of lithic materials, and though most of the tool stone is locally available, Trout Creek jasper is also represented in the assemblage (Liestman and Kranzush 1987).

Mountains

The known history of Middle Archaic occupation in the mountains of the Platte River drainage basin, like that of the Early Archaic period, is dominated by sites located at high altitude along the crest of the northern Front Range. These include previously mentioned sites, such as Coney Lake, and others newly discussed, such as the Flattop Mountain Game Drive, the Devil's Thumb Pass Game Drive and the Devil's Thumb Trail site, and the Berthoud Bridger camp on

Berthoud Pass. A short-term camp, the Button Rock Site, is located just above the hogbacks/foothills transition zone and the Old Man Mountain sacred site near Estes Park.

Flattop Mountain Game Drive Site (5LR6). Located at the headwaters of the Big Thompson River, this site is one of the most extensive game drive complexes in the area. It is composed of walls, blinds, and cairns. In all there are 14 rock walls, 49 alignments or clusters of cairns, and 90 blinds, which are circular to oval, semi-circular, and pear-shaped. Two blinds have parallel, straight walls and a trough-shaped depression between. Radiocarbon age estimates of 4310 ± 80 B.P. (2-sigma range of 3255-2669 cal B.C.) and 2620 ± 60 B.P. (2-sigma range of 894-557 cal B.C.) place Blinds 54 and Blind 46 in the Middle Archaic and Late Archaic periods, respectively, but the majority of the features are dated to the Early Ceramic period. However, based on relative lichen growth and granite weathering, Benedict (1996) has tentatively estimated the original construction of the drive line walls in the Early Archaic or Paleoindian period.

Will Husted's work in 1961-1962 resulted in collection of two fragmentary Mount Albion points, one Hogback corner-notched point, a midsection of a large corner-notched point, a sherd of plain ware, numerous flakes, and several sandstone grinding slabs. This collection was enlarged by Benedict's (1996) investigation. The projectile points, including those from early collections consist of four possibly Paleoindian points, and 49 Mount Albion Corner-notched dart points made of Dakota orthoquartzite, chert, porcellanite or siliceous argillite, and silicified wood. All of the points had been reused for butchering. Also found were two Mount Albion square-stemmed points or hafted knives of Dakota orthoquartzite; three stemmed, indented-base points of Kremmling chert, one stemmed concave- base point of Dakota quartzite and an Elko Eared point of Middle Archaic age; and several from the Early Ceramic period, which was also represented by brown ware sherds. Additionally, there were fragmentary projectile points, bifacial knives, a utilized core, large and small unifacial scrapers, numerous waste and utilized flakes, mainly of Dakota orthoquartzite and Kremmling chert, and several sandstone manos and metate fragments. An unusual large core/scraper/plane of Tiger chert, a material procured in the Bridger Basin of southwestern Wyoming or the Sand Wash Basin of northwestern Colorado, was also recovered (Benedict 1996).

Devil's Thumb Pass Game Drive Site (5BL103/5GA20). This site is an animal kill site containing 23 hunting blinds and two drive lines, one on a ridge in Boulder County and one on the Continental Divide in Grand County. Here animals were ambushed as they crested the divide. Benedict (1998) has estimated that 30 hunters would be required to operate the relatively large system. Based on radiocarbon data, occupations occurred in the Middle Archaic and Early Ceramic periods. Evidence for a Middle Archaic occupation came from Blind 1, from which a charcoal sample returned a radiocarbon age estimate of 4100 ± 60 B.P. (2-sigma range of 2874-2483 cal B.C.) (Benedict 1998).

Devil's Thumb Trail Site (5BL6904). The Devil's Thumb Pass Trail Site, located in a valley near the Devil's Thumb Pass Game Drive, served as a kill and butchering location, food preparation area, and possibly a vision quest location. Although sites in the area have produced projectile points affiliated with Late Paleoindian through the Protohistoric periods, projectile points included four artifacts identified as possibly Archaic stage corner-notched artifacts and a Park point. There is also evidence for later use of the site. Pottery identified as Dismal River was found there and radiocarbon age estimates from the site document Early Ceramic period and modern phenomena as well (Kindig 1997a, 1997b).

Button Rock Site (5BL4838). The site is an open camp situated on a ridge top overlooking the North St. Vrain River valley near Lyons. Surface inventory and testing of the site revealed Early Archaic points. However, no evidence of an intact Early Archaic occupation was found. Excavation efforts yielded two features, an intact, slab-lined hearth (Feature 2) and another hearth (Feature 3) found in a natural bedrock depression. A charcoal sample from Feature 2 returned a radiocarbon age estimate of 3450 ± 60 B.P. (2-sigma range of 1898-1611 cal B.C.). Charcoal from Feature 3 yielded an age estimate of 3380 ± 120 B.P. (2-sigma range of 1962-1409 cal B.C.). No artifactual material was recovered in association with either feature. Charcoal recovered from the features indicates that pine was the fuel. The only pollen recovered was from Feature 2 and represented the genus Labiatoe, the mint family. Grant and De Angelo (1998) inferred that the site represents one or more ephemeral occupations by plains-oriented people who took advantage of natural bedrock outcrops for their shelter value.

Berthoud Bridger Site (5CC79/5GA306). This site is an open lithic scatter located at the top of Berthoud Pass. The site was discovered during a survey for the expansion of U.S. Highway 40 and subsequently tested. Six projectile points, several bifaces (including a graver) and numerous flakes were recovered, but no features were noted. In addition to Late Prehistoric projectile points, a Mallory point base of gray-white chert was recovered. Kremmling chert, at 60 percent, was the most prevalent tool stone. Jasper and other cherts (including Tiger chert), quartzites, petrified wood, obsidian, and chalcedony were also represented. Charcoal was encountered scattered in test units in the area with the highest artifact density, but no features were noted (P. Gleichman 1984; C. Gleichman 1984).

Old Man Mountain 5LR12. The site is located on a conical granite hill on the western edge of Estes Park in Larimer County. The area is a sacred place, believed to be a vision quest site, where five artifact localities have been identified and collected by various individuals over the years. The area is characterized by the random placement of erratic stream boulders of unknown function found in association with artifacts, which are believed to represent religious offerings. Based on the weathering of granite river boulders, the site was used at least 3000 years ago, although Middle and possibly Early Archaic projectile points including Mount Albion and stemmed, indented-base points indicate possible earlier use. However, there is relatively abundant artifactual evidence for Late Prehistoric stage use of the area, and earlier types may simply be prehistorically curated specimens (Benedict 1985b).

In North Park, Lischka et al. (1983) identified 23 Middle Archaic components, 11 of which were single-component sites. Investigators found diagnostic artifacts for the period, including an Oxbow type known from the Northern Plains during late Early Archaic and early Middle Archaic times. Also found were several Mallory Side-notched points, as well as a number of the stemmed, indented-base points generally associated with the McKean complex. Later inventories have also yielded McKean and Mallory points (Metcalf 1984; Mecham 1987). In South Park, surface inventories have revealed McKean lanceolate and Duncan points (Noisat 1983), such as that found at 5PA623, an open camp (Weimer and Weimer 1992), and a Hanna point found on a multicomponent open lithic site near Reinecher Ridge (Metcalf 1979). Weimer (1995) also found projectile points of Middle and Late Archaic affiliation at Site 5PA718, a large open campsite.

Summary and Conclusions

Occupations from nine sites on the plains of Colorado are radiocarbon dated to the Middle Archaic, and a few others (e.g., Wilbur Thomas Shelter and 5WL40) have been excavated but not radiocarbon dated. For the most part, the sites are open camps, but there is also one burial known. Often multiple hearths are present and range from simple unlined basins to rock-filled and slab-lined features. These sites contain a broad range of flaked lithic tools and bone tools, occasional bone beads, and ground stone. Almost all of the sites contain complex artifacts, diagnostic McKean complex. Those in the northern foothills near Fort Collins also often contain the large Mallory Side-notched type. Faunal remains indicate reliance on a wide range of both large and small animals, and macrofloral evidence suggests that a variety of seed and plant parts, including starchy roots and cactus pads, were processed for food. The only radiocarbon-dated burial for the period in Colorado is the Witkin Burial; however, the Sidney Burial site, as discussed above, is located only a few miles north of the state line in the Nebraska panhandle.

In the hogbacks/foothills, the number of absolute dated with Middle Archaic sites is 13, one less than the preceding period. The same sites often contain evidence for both Early Archaic and Middle Archaic occupations. The Middle Archaic occupations, however, are significantly different from those of the Early Archaic in that they contain much more cultural material and, thus, more information. The sites, which include sheltered and open camps, commonly have multiple hearths, often stone filled and occasionally slab lined. They also have a broad range of flaked lithic and bone tools, as well as abundant ground stone. Diagnostic artifacts in the northern foothills are typically McKean and Mallory points. To the south near Denver, McKean points, particularly Duncan and Hanna are also found, but type MM 3 points are also common during this period, and they are often found in the same sites. The only documented storage pit for the period, a stone-walled feature, was found at Bradford House III (Johnson and Lyons 1997b), a hogback site. The earliest dwelling-type architecture, post molds, was found at Dancing Pants (Liestman and Kranzush 1987), a foothills site. Both are sheltered camps. Finally, there is a dated burial from the period and two undated burials that are believed to be Middle Archaic in origin.

Just three sites with radiocarbon-dated occupations are known from the mountains during the Middle Archaic period, although numerous sites are tentatively identified as Middle Archaic on the basis of surface diagnostic artifacts. The radiocarbon-dated sites include two large, multicomponent game drives located near the Continental Divide in Boulder and Larimer counties and a small open camp in Boulder County.

Late Archaic Period (3000 B.P.-1800 B.P)

The trend toward increasing numbers of sites, continues in the Late Archaic period, with slightly more absolute-dated sites with Late Archaic occupations in all three subareas than are known for either of the earlier two periods. See Figure 5-6 for site locations. In addition, the increase in reported diagnostic artifacts from surface inventory is significantly higher.

Plains

Eighmy (1984) reported three radiocarbon-dated components or campsites in northeastern Colorado dating to the Late Archaic period: Zone E of the Uhl site (Wood 1967), Happy Hollow Rockshelter (Steege 1967), and Dipper Gap (Metcalf 1974). An additional radiocarbon age

estimate from the Merino Site, a bison kill, may date a late Middle Archaic or early Late Archaic event, but the site's context is very disturbed (Morris and Kainer 1975). As is true for the earlier Archaic periods, several other sites have been investigated or reinvestigated since the 1980s. While some of these are components of sites discussed earlier, i.e., Dipper Gap (Metcalf 1974), 5WL48 (Jepson et al. 1994), and 5AH741 (Graham 1998), there are also several sites, most of which have been radiocarbon dated to the period, that have not been previously discussed. The latter include Rattlesnake Shelter and 5WL2011 (Brunswig 1996), 5WL1555 (Jepson et al. 1994), 5WL1794 and 5WL1795 (Painter et al. 1995), Margaret B. "Best" Van Ness Site (Kalasz et al. 1996), 5AH132 (CDOT Files 1980), 5AH378 (O'Neil and Tate 1986), and the Webster Feedlot Burial (Wanner and Brunswig 1992).

Uhl Site (5WL32). This site is one of 16 located in the Battle Canyon and Pawnee Creek areas of northeastern Colorado that were excavated by J. J. Wood of CU. The Uhl site, in the Battle Canyon area, is a sheltered camp located on a south-facing shelf below the canyon rim, overlooking a dry sandy wash. The box canyon in which the site is situated contains several seeps and springs. Five cultural components were identified at the site. Designated Zones A-E, Zone E dates to the Late Archaic period, and Zone A documents nonaboriginal, historic use of the shelter. Charcoal from three samples in Zone E returned radiocarbon age estimates of 1955 $\pm$ 95 B.P. for Feature 9, 2010 $\pm$ 65 B.P. from the wall of one of the excavation units, and 2170 $\pm$ 160 B.P. from Feature 4 (2-sigma range of 178 cal B.C.- cal A.D. 317; 174 cal B.C.- cal A.D. 130; and 758 cal B.C.- cal A.D.196, respectively). The majority of the site's cultural features, seven hearths, were found in Zone E. Most were relatively deep, rock-filled, basin-shaped pits; one was slab-lined. Faunal bone, some of which was burned, and ground stone were found in the feature fill. The most distinctive artifacts from Zone E are medium-sized triangular projectile points with wide shallow-diagonal notches and straight bases, which Eighmy (1984) noted were similar to those at Dipper Gap. A variety of blades, scrapers, retouched and utilized flakes, and cores was also found in Zone E. These are similar to those of the next youngest Zone D. Manos and metates were also recovered, as were a few pieces of ocher and a piece of hematite. Bone present indicates that a wide range of game animals were hunted; pronghorn remains were slightly more numerous than bison. The author concluded that the site represents a discontinuous sequence of occupations from early in the Late Archaic period. Zone E and the subsequent pottery bearing Zone D are seen as successive occupations with cultural continuity. Zone E is seen as representing a simple hunting and foraging complex that continued into Zone D with similar projectile points and the addition of pottery but with no change in lifeways (Wood 1967).

Happy Hollow Rockshelter (5WL101). A sheltered camp, the site is situated atop a bluff under an erosional remnant of the Ogalalla Formation near Carr. Here, investigators found evidence for occupation during the Late Archaic, as well as the Early and Middle Ceramic periods. Charcoal from two hearths, Features 6 and 7, at the site produced radiocarbon age estimates 2170 $\pm$ 80 B.P. and 2680 $\pm$ 90 B.P. (2-sigma range of 394 cal B.C.- cal A.D. 6 and 1005-558 cal B.C., respectively). The base of a large, side-notched projectile point was found at the top of Feature 6. Three other points dating to the period, two large corner-notched artifacts and one likely Besant point were also recovered at the site. The site contained a wide variety of flaked lithic artifacts, including abundant retouched flakes and numerous spent cores, as well as ground stone. There were also numerous animal bones found in all occupational levels. Most were broken into small pieces, most likely to obtain marrow. In order of frequency these included elk, bison, pronghorn, deer, prairie dog, rabbit, and packrat. Most of the faunal assemblage, however, probably results from the latter occupational periods at the site (Steege 1967).

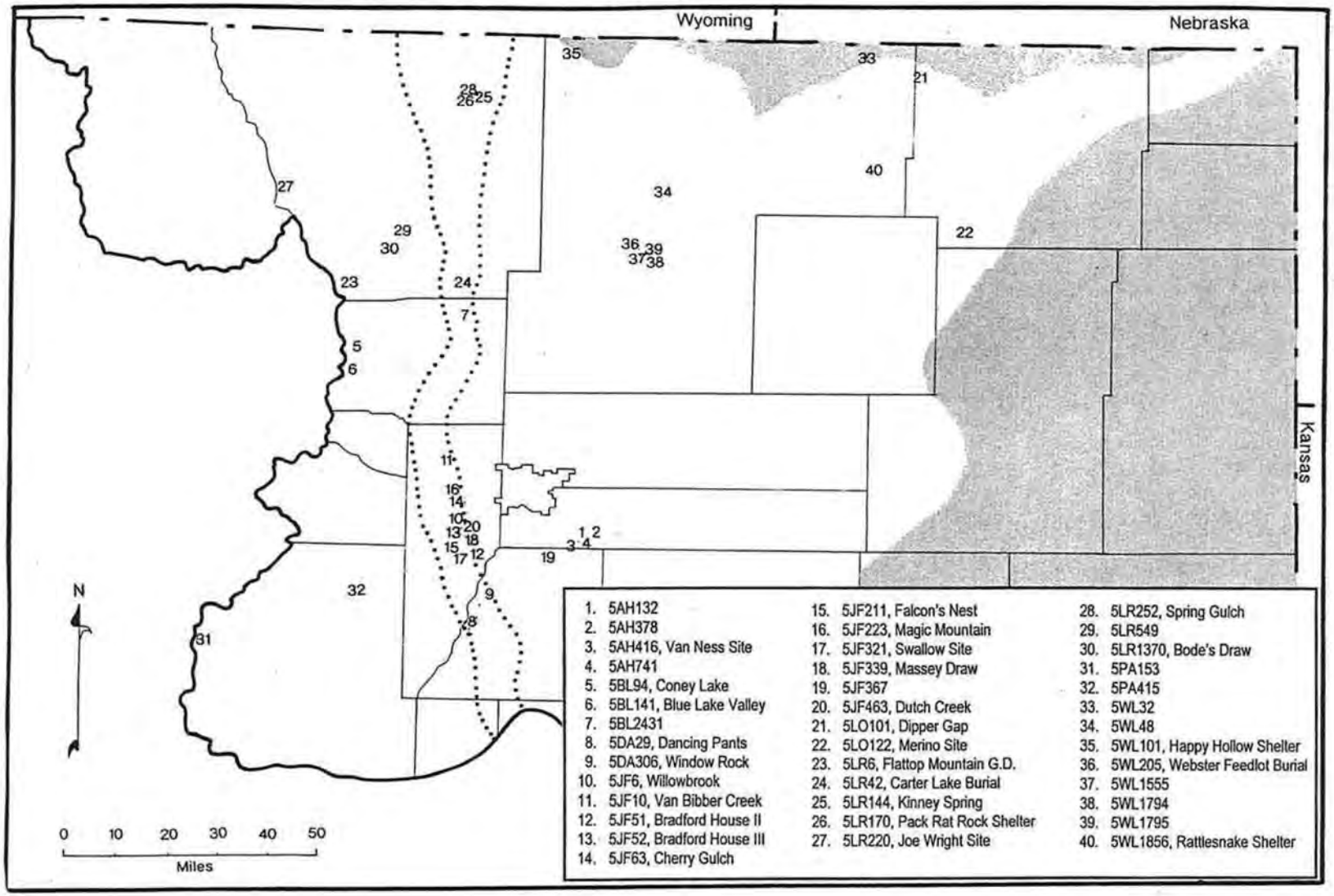

Figure 5-6. Locations of Late Archaic sites.

Dipper Gap Site (5LO101). The site is well-known for the Middle Archaic occupations embodied in its Zone D. Zone C at Locality I of the site correlates to the currently designated Late Archaic period occupation. Here, a basin-shaped hearth and two large triangular projectile points, one Group 16 corner-notched and one Group 13 side-notched, were found in general association with bifaces, end scrapers, perforators, and retouched flakes. The side-notched projectile points types are also known from Zone B at Magic Mountain (Irwin-Williams and Irwin 1966) and the corner-notched type was found at the Uhl site (Wood 1967). No radiocarbon age estimate was obtained for Zone C (Metcalf 1974).

Merino Site (5LO122). The site is a postulated bison kill and butchering location found on the edge of a channel cut on the north bank of the South Platte River. The site was discovered by Thomas Pomeroy and Harvey Hahn after it was exposed by spring floods in 1973. Large quantities of disarticulated and partially articulated bison bone were on the site's surface, as were occasional flaked lithic tools and ground stone fragments. In the fall of 1973, personnel from CSU excavated the site with the assistance of the site's discoverers and their families. Most of bone recovered from the site was *Bison bison* representing at least six animals, but other species were also represented. The latter bones are interpreted to result from later, possibly natural events. Morris and Kainer (1975) that the site was considerably disturbed and that bones and artifacts had been redeposited by flooding since the time of deposition. The age range of the bison was approximately from 7-10 months to over 10 years. The herd was predominantly cows, with possibly a single young bull. The kill event likely occurred in late fall or winter. A sample of charcoal painstakingly gathered from a disturbed hearth yielded a radiocarbon age estimate of 2945 $\pm$ 1475 B.P. or calibrated age of 1127 B.C. (2-sigma range of 4781 cal B.C.- cal A.D. 1955); the large standard deviation was a result of the very small sample size available. Bifacial tool fragments, plano-convex scrapers, end scrapers, a chopper, handstones, grinding slabs, hammerstones, and cores, were recovered (Morris and Kainer 1975).

In a continuation of the 1960s investigations sponsored by CU, personnel the UNC documented 85 sites within the West Stoneham Archaeological District between 1992 and 1996. Involving systematic surface inventory and testing of some sites, the project resulted in the identification of six Late Archaic site components. Four of the sites are described as fairly ephemeral open camps. Three of the sites, 5WL1840, 5WL1844, and 5WL1857 also contain stone circles but the fourth, 5WL2134, does not. The remaining two Late Archaic sites are sheltered camps, the Rattlesnake Shelter and site 5WL2011.

Rattlesnake Shelter (5WL1856). This small, relatively deep rockshelter was found beneath the rim of a sandstone outcrop ridge overlooking a small playa. Testing of the site revealed abundant cultural materials. Three occupations were identified, only the lowest and earliest, Unit 3, had stratigraphic integrity; the upper two units were mixed. Three features were found in Unit 3, two bison bone concentrations and a hearth. Charcoal from the latter, Feature 3, returned a radiocarbon age estimate of 1920$\pm$80 B.P. (2-sigma range of 59 cal B.C.- cal A.D. 320). Additional radiocarbon age estimates obtained from humic soil and charcoal samples in the unit were 2600 $\pm$ 100 B.P., 2680 $\pm$ 60 B.P., 2760 $\pm$ 80 B.P., and 3350 $\pm$ 70 B.P. (2-sigma range of 923-407 cal B.C.; 923-783 cal B.C.; and 1117-796 cal B.C.; and 1861-1449 cal B.C., respectively). Unit 3 yielded 10 formal and informal tools. Formal tools included a multisided scraper and four bifaces, two of which are projectile points. One of the points is a large, triangular, corner-notched projectile point similar to those from Van Bibber Creek (Nelson 1969) and to Butler's (1986) Late Archaic Corner-notched Type 3. The second point had a curving blade and a single hafting notch

on its opposite side. This artifact also resembles one from Van Bibber Creek. Informal tools included two scrapers, a graver, a knife, and a core chopper. Analysis of debitage suggested that initial core reduction occurred elsewhere, although five cores were recovered. Most of the Artifacts were of local materials; quartzite was predominant. Of the minimal amounts of snow cover flaked lithic materials, Flattop chert and Hartville chert from Wyoming had the highest frequencies. No ground stone was found. The most common faunal taxon by weight was bison, although minimal amounts of pronghorn, rabbit, rodents and unidentified bird, and dog or coyote were also represented. No economic floral resources except charcoal from a woody shrub and microbotanical materials were recovered. The site is interpreted to be a short-term, multiple-episode, probably seasonal camp used by small forager-oriented groups who hunted local game and carried out primary and secondary lithic manufacture and tool repair activities (Brunswig 1996).

Site 5WL2011. A second sheltered camp is situated in a small overhang along the west ridge line of the western playa valley at West Stoneham. Minimal testing at the site revealed a very shallow cultural deposit extending to a depth of no more than 12 cm, where bedrock of the White River Formation was encountered. Unit 2, interpreted to represent a Late Archaic occupation, was found in the lowest 4-8 cm level and contained pockets of ashy soil and sparsely scattered charred bone. A hafted biface found in the rear of the shelter resembles artifacts from Van Bibber Creek (Nelson 1969), Dipper Gap (Metcalf 1974), and Spring Gulch (Kainer 1976), and conforms to Butler's (1986) Late Archaic Corner-notched Type 3 projectile point. Debitage at the site indicates that lithic reduction activities at the site involved the later stages of tool manufacture or retouch (Brunswig 1996).

A group of multicomponent open camps was examined in the 1990s in conjunction with the widening of U.S. Highway 34 between Hardin and Greeley. Four sites (5WL48, 5WL1555, 5WL1774, and 5WL1775) yielded evidence for Late Archaic occupation.

Site 5WL48. This is a large camp located on and in a semistabilized dune overlooking the South Platte River. The site was originally investigated by the UNC field school in 1973 and 1974. At that time, Lutz (1974) examined a "Woodland" occupation that included a secondary burial. He noted, however, that an earlier occupation lay beneath the Early Ceramic occupation in Locality II. Subsurface testing for the highway project was conducted in parts of the site not previously investigated (Jepson et al. 1994). The results of the later effort were somewhat meager, because of the site had been destroyed in the interim. However, the collected materials indicated Middle and Late Archaic occupations. Samples of fill from three of four hearths submitted for radiocarbon dating returned the following age estimates: 2290 $\pm$ 50 B.P. (2-sigma range of 405-198 cal B.C.) from Feature 17; 2810 $\pm$ 80 B.P. (2-sigma range of 1198-807 cal B.C.) from Feature 10; and 2830 $\pm$ 50 B.P. (2-sigma range of 1254-813 cal B.C.) from Feature 15. A single artifact diagnostic of the Late Archaic, a large corner-notched point, was also recovered. The remaining artifact assemblage, which included bifacially retouched and utilized flakes, was debitage, primarily tertiary flakes of chert, quartzite, and chalcedony. A single mano was recovered. The faunal remains were primarily bison and unidentified artiodactyl, with a small amount of jack rabbit. Macrofloral remains included small amounts of goosefoot seeds and a single berry. Based on the limited information present, the authors concluded that the site's Archaic occupations were brief and transitory.

Site 5WL1555. The site was located on a dune remnant in a setting similar to that of 5WL48. Investigations at the site revealed 13 hearths, exposed during highway construction. Ten of the hearths were salvaged. Charcoal samples returned radiocarbon age estimates of 2070 + 100 B.P. (2-sigma range of 373 cal B.C.- cal A.D. 6) from Feature 5 and 2890 ± 80 B.P. (2-sigma range of 1309-842 cal B.C.) from Feature 9. The flaked lithic assemblage was mostly tertiary flakes, with few tools, although there was a relatively large quantity of grinding tools. Limited bone consisting of artiodactyl and bison was found, despite the substantial number of hearths. Based on the results of the investigation, Jepson et al. (1994) concluded that vegetal food processing and late-stage tool manufacture were the primary site functions.

Site 5WL1794. This open camp was found in a sand dune on the Kersey terrace of the South Platte River. Survey and test excavations at the site revealed several hearths, some of which were outside the project area. A charcoal sample from one of the hearths, Feature 8, returned a radiocarbon age estimate of 2970 ± 90 B.P. (2-sigma range of 1415-915 cal B.C.). Conifer charcoal and charred Russian thistle seeds were recovered from Feature 5, another hearth. The site produced few artifacts and a faunal assemblage of deer and bison long bone fragments, which were not associated with any of the known features (Painter et al. 1995).

Site 5WL1795. This site is located near 5WL1794. Two hearths were found at the site, along with the hafted element of a bifacial tool, an edge-modified flake, a ground stone fragment, and debitage. The biface fragment, possibly of Late Archaic origin, lacked sufficient diagnostic traits to conclusively identify its temporal/cultural affiliation (Painter et al. 1995).

Several sites found during the surveys of the Denver International Airport site were tentatively assigned to the Late Archaic period on the basis of diagnostic artifacts. At 5DV3013, a fragmentary, corner-notched Late Archaic was recovered. A more broadly dated Park point (Middle-Late Archaic) was found at 5DV3108. An isolated atlatl weight was also found (Tate et al. 1989a).

Farther north and east, a sample survey was conducted to assess 42,400 ha (106,000 acres) reservoir area of the Narrows Project on the South Platte River in Weld and Morgan counties. More than 300 prehistoric and historic sites were found spanning 11,000 years of occupation (Morris et al. 1975). As Eighmy (1984) notes, most of the aceramic sites were occupied during Archaic times.

Numerous other surveys, many in the Pawnee Grassland, have also resulted in the identification of Late Archaic corner-notched points (e.g., Brechtel et al. 1979; Gleichman 1992a and 1994; Grant 1992; Halasi and Huse 1978; Noisat 1995), as did a site tested near Fort Morgan (Mutaw 1996). Surveys in Aurora and south of Castle Rock also yielded Late Archaic points (Tate 1991, Tate 1995a).

Margaret B. "Best" Van Ness Site (5AH416). The site is an open camp found in an area of rolling hills overlooking Cherry Creek in southeastern Arapahoe County. The site was initially recorded in 1987 by Kathryn Joyner (1988) during an inventory for the proposed E-470 beltway, one of 22 sites with prehistoric components recorded in the 80 km (50 mile) length of the highway corridor. Diagnostic artifacts from the site largely represented Late Archaic and Early Ceramic occupations. Shovel tested by Dames & Moore (Rhodes 1990), the site was excavated by Centennial Archaeology in 1995. The Centennial team found that because of ongoing water erosion, features

visible in the 1987 survey had been displaced or destroyed. Their excavation, however, revealed five hearths, abundant lithic artifacts, and relatively few ceramic sherds. Charcoal samples returned radiocarbon age estimates of 1860±70 B.P. from Feature 5B, 1920 ± 90 B.P. from Feature 2, and 1960 ± 100 B.P. from Test Pit 1, (2-sigma range of cal A.D. 11-342; 103 cal B.C.-cal A.D. 330; and 190 cal B.C.- cal A.D. 320, respectively). All are considered to date occupations of transitional Late Archaic-Early Ceramic age. Features 2 and 3 are small, circular hearths, which like all of the hearths at the site, were unlined and cobble filled. The predominant fuel in these hearths was Ponderosa pine, but mountain mahogany and alder were also found. The hearth fill contained potentially edible tissue (PET) fruit fragments and in the case of Feature 3, a few charred cactus parts. Associated with both features were sparse amounts of petrified wood expedient flake tools and waste flakes. Feature 3 had been excavated into the decomposing arkosic sandstone. Excavation into decomposing bedrock is a somewhat unusual phenomenon that was also seen in small, basin-shaped pithouses and other features at Box Elder-Tate Hamlet (Tucker et al. 1992). Feature 5 is been described as an unusual, circular, steep-walled pit filled with burned cobbles, including several manos, and large chunks of ponderosa pine charcoal. The lower level, designated Feature 5B, contained a dense layer of cobbles, a single charred goosefoot seed and a PET fragment. The associated artifact assemblage from the grid block around of Feature 5 included 2,625 pieces of debitage or 71 percent of the project total. There were relatively few cortical flakes and the vast majority were petrified wood, as were the few formal tools. The manufacturing strategy was oriented toward producing expedient flake tools and bifaces; early and middle-stage bifaces were predominant. Analysis of debitage size suggested that raw materials were considerably reduced before being brought to camp, and then bifaces were manufactured for transport to other sites in a seasonal round and finished as needed. Five projectile points, all Late Archaic styles, were recovered, as were six pieces of ground stone. The ground stone was small, fragmentary, and only minimally modified. Metates were rare, a phenomenon also noted for sites in the Aurora Reservoir survey area a few miles to the north (O'Neil and Tate 1986). Investigators at 5AH416 concluded the site was a short-term camp used primarily for petrified wood collection and reduction activities, with minor faunal and wild plant processing, the latter possibly in late summer/fall. Because the earlier occupations at the site lack ceramics and small arrow points (hallmarks of Ceramic occupation) but had larger dart points, they were designated Late Archaic (Kalasz et al. 1996).

Site 5AH741. This is another of the E-470 sites in western Arapahoe County, which yielded evidence for occupations dating to the Middle Archaic period and end of the Late Archaic period; the latter occupations, however, were more intensive and spatially more extensive than those of the early period. Two radiocarbon age estimates, 1780 ± 60 B.P. for Feature 7 (2-sigma range of cal A.D. 118-413) for Feature 7 and 1740 ± 60 B.P. (2-sigma range of cal A.D. 139-428) for Feature 9, document the Late Archaic occupations. Though these age estimates may traditionally be considered to date Early Ceramic occupations, Graham (1998) considered the cultural manifestation to be Archaic in the absence of ceramics. In addition to several hearths, the Late Archaic levels yielded thousands of flakes and more than 100 tools and cores. As with the Middle Archaic assemblage, the vast majority of the flaked materials are petrified wood, which is locally abundant; various sandstones comprise the ground stone. The composition of tool types (i.e., bifaces and flaked tools, manos and metate fragments) was also similar. However, unlike the Middle Archaic assemblage, there are four projectile points included. One of the projectile points is a large artifact with shallow side notches, a straight base, and excurvate margins. This artifact is similar to points designated LoDaisKa type aa (Irwin and Irwin 1959), Magic Mountain type MM 35 (Irwin-Williams and Irwin 1966), and some from Dipper Gap Zone B (Metcalf 1974), all of

which are considered Woodland. The point also resembles points found at Box Elder-Tate Hamlet (Tucker et al. 1992) that are considered to date from the Late Archaic to the Middle Ceramic periods (Tucker 1992). Two of the remaining points are fragmentary and nondiagnostic, another is a small, corner-notched point with a straight base and blade margins. In addition to petrified wood procurement and reduction activities, the prevalence of perforators and scrapers in the Late Archaic assemblage indicates that hide processing likely occurred at the site. Faunal materials, including a calcined bone from Feature 9, indicate that rabbit and a medium-sized mammal were cooked or processed, and blood residue on a knife indicates processing of deer/elk/moose. Macrofloral evidence indicates that pincushion cactus pads and goosefoot seeds were processed; ground stone washes show that biscuitroot and/or bitterroot were also used. During the Late Archaic period, the site was probably occupied during two seasons, spring and late summer.

Sites 5AH132 and 5AH378. Site 5AH132 was an isolated hearth encountered during one of many CDH (CDOT files 1980) investigations. There were no associated artifacts, but a charcoal sample from the feature returned a radiocarbon age estimate of 2400 $\pm$ 60 B.P. (2-sigma range of 766-376 cal B.C.). At Site 5AH378 in the Aurora (Senac) Reservoir survey area, a similar feature produced a radiocarbon age estimate of 1870 $\pm$ 80 B.P. (2-sigma range of 32 cal B.C.- cal A.D. 375), placing the site at the Late Archaic/Early Ceramic transition (O'Neil and Tate 1986). This site is in the Aurora (Senac) Reservoir survey area.

In the vicinity of the E-470 beltway, surveys of Buckley Air National Guard Base, the Aurora Reservoir and adjoining areas, and recently, of undeveloped land of the City of Aurora revealed Late Archaic projectile points (Tate et al. 1990; Phillips and Bamfrey 1997; Tate and Friedman 1986; Abernathy 1982). An inventory of Rocky Mountain Arsenal lands (Clark, B. J. [ed] 1997) to the north revealed the same.

Webster Feedlot Burial (5WL205. Also known as the Weld Burial, the site was on a high terrace of Lone Tree Creek, a tributary of the South Platte River, near Greeley. The burial was salvaged by a local amateur archaeologist after its exposure in a cattle feedlot earth-moving operation. The skeletal remains were subsequently curated at the UNC, where they were analyzed. Radiocarbon dating of the bone fragments yielded an age estimate of 2080 $\pm$ 160 B.P. (2-sigma range of 407 cal B.C.- cal A.D. 319), placing the skeleton most likely in the Late Archaic, but also possibly in the Early Ceramic period. The remains were those of single individual, probably a female, between the ages of 20 and 30 years. Among the various analyses were radiographic stress line and carbon isotope. Age analysis of the femoral lines of the skeleton showed a minimum of 13 episodes of growth arrest before the age of 10 years. Carbon isotope analysis demonstrates sources of diet by measuring ratios of $^{13}C/^{12}C$. Most plants in temperate environments concentrate low ratios of ^{13}C to ^{12}C and are designated C3 plants, but tropical plants concentrate high ratios of ^{13}C to ^{12}C and are called C4 plants. Wanner and Brunswig (1992:376-377) have explained that prehistoric North American populations have intermediate to high ratios if their diets include cultivated plants derived from tropical antecedents, such as corn, beans, and squash. The Weld skeleton was in the intermediate low portion of the spectrum compared to others from agricultural and nonagricultural North American populations, indicating a low probability that cultivated plant food originally from the tropics was part of the diet (Wanner and Brunswig 1992).

Hogbacks/Foothills

Though the number of absolute-dated sites or components in the hogbacks/foothills area representing Middle Archaic occupations is considerably larger than those of the Early Archaic period, no such increase is noted in the quantity of dated Late Archaic sites here. Many of the sites discussed below have earlier Archaic components, which have been described above, and most have Early Ceramic components or occupations as well. Five sites have not been previously discussed: the Carter Burial (Gleichman and Mutaw 1994), 5BL2431 (Grant 1990), 5JF367 (Angulski 1986), the well-known Willowbrook (Leach 1966) and Van Bibber Creek (Nelson 1969) sites, and the Window Rock Site at Roxborough State Park (Tate 1979),

Spring Gulch Site (5LR252). At this site located northwest of Fort Collins, Late Archaic occupations are characterized by a group of diagonally notched projectile points with concave to convex bases, designated Types 10-12, 16, 18, and 22-24. Found at Locality I in the lower portion of Stratigraphic Level III, they were also recovered from Levels IV and V. Kainer (1976) believes that these may represent a continuum from the earlier stemmed forms of the Middle Archaic period. Charcoal samples from Level IV returned age estimates of 2340 $\pm$ 85 B.P., 2415 $\pm$ 85 B.P., and 2830 $\pm$ 135 B.P. (2-sigma range of 764-192 cal B.C.; 794-260 cal B.C., and 1392-784 cal B.C., respectively) (Kainer 1976).

Kinney Spring (5LR144). At the open camp known as Kinney Spring, investigators found limited evidence for Late Archaic occupations, as well as those of the earlier Archaic and Early Ceramic periods. Though no Late Archaic occupations were dated by absolute means, two projectile points diagnostic of the period were found directly beneath the Early Ceramic levels. Bone at the site included fragmentary bison bone, the remains of smaller animals, and a few scattered, unarticulated, human skeletal remains. The temporal/cultural affiliation of the latter was not identified (Morris et al. 1984).

Pack Rat Shelter (5LR170). Primarily known for its Middle Archaic occupations, Pack Rat Shelter also yielded evidence for Late Archaic occupations. The site had several lined and unlined hearths; charcoal samples produced three Late Archaic radiocarbon age estimates: 2440 $\pm$ 80 B.P. from Feature 56; 2480 $\pm$ 90 B.P. from Feature 57; and 2760 $\pm$ 70 B.P. from Feature 51 (2-sigma range of 797-376 cal B.C., 810-384 cal B.C., and 1046-801 cal B.C., respectively). In addition to flaked lithic artifacts, investigators found ground stone, bone tools, and disarticulated human remains in disturbed contexts (Morris et al. 1981; Morris et al. 1985).

Carter Lake Burial (5LR42). This site is located on a terrace adjacent to Carter Lake west of Berthoud. A north/south-trending basin formed by surrounding ridges, created a natural lake, which was later enlarged by the Bureau of Reclamation and became known as the Carter Lake Reservoir. The archaeological site was reported by local amateurs and recorded by Joe Ben Wheat of CU in 1955. Originally described as an open camp, the site once covered at least 6 ha (5 acres) and had cultural materials up to 1.8 m (6 ft) thick exposed in a cut bank. Flaked lithic tools, ground stone, and bone tools were listed as part of the site assemblage. In 1982, human bone was observed eroding from the cutbank, as was a possible hearth (Kranzush 1982). In 1992, when the burial had become further exposed, Native Cultural Services was contracted to disinter the human remains. At that time, in situ skeletal materials from a primary flexed burial were recovered. The burial had been placed in a pit that was excavated through the camp's midden deposits. The corpse had been placed on its left side with the head to the east facing southeast. There were no

funerary offerings. At least two large sandstone slabs were placed over the body, then soil containing midden materials was used to cover the burial. Thus, when investigators disinterred the human remains, they found numerous artifacts not associated with the burial, including flaked stone and burned bones. A complete Hanna point was found just east of the burial pit on a large rock in the cutbank, presumably redeposited as a result of erosion. Analysis of the burial remains indicated that the individual was a female, aged 45-55 at the time of death. Charcoal samples from the midden deposits produced two radiocarbon age estimates, 1650 ± 90 and 1850 ± 90 B.P. (2-sigma range of 32 cal B.C.- cal A.D. 407). Although the age of the burial may be bracketed between these two dates or may be younger than either, the authors concluded that the burial dates to the end of the Late Archaic or to the initial Early Ceramic period (Gleichman and Mutaw 1994).

Northwest of Loveland, an inventory by CSU reported 27 sites, with 12 Late Archaic components identified by the presence of corner-notched dart points. The sites represent multiple periods of occupation and include camps (one of which contains a stone circle) open lithic sites, quarries, and rockshelters (Travis 1988). Another large inventory near Boulder also yielded numerous open lithic sites. While diagnostic artifacts were scarce, a corner-notched point similar to those reported above was found (Grant et al. 1996).

Site 5BL2431. This stratified multicomponent camp is located on a finger ridge in a plowed field overlooking Dowe Flats basin to the west and north. The site was recorded and subsequently tested by Burney and Associates in an area planned for mining and reservoir construction. Here investigators found two well-defined buried cultural components, the uppermost representing Early Ceramic occupation and the lower of Late Archaic affiliation. A charcoal sample from the lower component returned a radiocarbon age estimate of 2610 ± 70 B.P. (2-sigma range of 898-532 cal B.C.). No diagnostic artifacts were recovered in the Late Archaic levels, but debitage, flaked stone tools, ground stone, and possible bone beads or gaming pieces were found. Eighty-three percent of the debitage was tertiary flakes, primarily of quartzite, chert, chalcedony, and petrified wood; a single core of rhyolite was found. Also, 26 pieces of burned and unburned bone recovered from Stratum IV correlated with the Late Archaic occupation. Both large and small animals were represented. Pollen washes of ground stone indicate possible grinding of goosefoot, sunflower, and grass seeds, as well as processing of prickly pear, pine nuts, and possibly squawbush berries (Cummings 1990). Grant (1990) has inferred the site to be a base camp where tool manufacture and maintenance, hunting and processing, and plant processing occurred (Grant 1990).

5JF367. This isolated firepit was found in Piney Creek alluvium during an inventory in 1985 conducted in conjunction with a CDOH project. Charcoal from the feature, found in Leyden Gulch near State Highway 93, yielded a radiocarbon age estimate of 2380 ± 50 B.P. (2-sigma range of 756-376 cal B.C.). No diagnostic artifacts were associated with the find (Angulski 1986).

Massey Draw (5JF330). Massey Draw is a camp and bison processing site just east of the Dakota hogback. The site's major occupations, dating to Late Archaic times, are found in Camp Levels C-F and Bone Levels IV-VI. Charcoal samples from these levels yielded a number of radiocarbon ages, ranging from 1960 ± 80 (2-sigma range 158 cal B.C.- cal A.D. 240) to 2930 ± 60 (2-sigma range of 1310-926 cal B.C.). A minimum of one bison and one pronghorn are represented in the bone recovered from Camp Level C, and Camp Level D produced remains of a bison, a deer, and a mountain sheep. Bone Level IV remains indicate butchering of three bison bulls, deer, and

mountain sheep. Bone Level V contained the remains of two bison (one a cow) and mountain sheep; while in Level VI, a minimum of two bison bulls and a cow, as well as deer, are represented. Pollen and macrofloral analysis indicated that alder and pine were fuel sources at the site and that the seeds of Cheno-Am, sunflower, hedgehog cactus, and rose were used for food or medicinal purposes. Lithic analysis of recovered cultural materials from the site indicates that 205 of 261 flaked tools are nonbifacial cobbles and nodules, edge-modified flakes, and notched and unnotched unifacially thinned and edge-modified flakes. Additionally, 56 bifaces, 20 complete stemmed bifaces, and 3 incomplete stemmed bifaces were recovered. Of the projectile points, Types 10-16 are of Late Archaic affiliation and are comparable to those from sites in the region. The points include a number of corner-notched triangular points, such a Pelican Lake type, and a stemmed, indented-base Hanna point. Also present were incomplete stemmed points, miscellaneous incomplete bifaces, manos, an incised cobble, ocher (bone area), a hammerstone, bone awls and polished bones, and a probable bead, all recovered from Camp Levels C-F and Bone Levels IV-VI. All flake stages were represented, but the vast majority of flakes are tertiary. Of all debitage, almost half is quartzite, followed by chert, petrified wood, quartz and quartz crystal, and minute amounts of obsidian. Heat alteration was not a common technique used at the site. Investigators concluded that the site was occupied only intermittently for short periods during late spring. The butchering of bison was a dominant activity, with bison carcass segments transported from a probably nearby kill site to the Massey Draw site. Here, muscle masses were stripped and upper limb bones were broken for marrow. There was no evidence of bulk processing and bones do not appear to have been reduced for grease manufacture. The bones of medium-sized animals at the site are also believed to represent subsistence activity, although bones of smaller animals may or may not (Anderson et al. 1994).

Dutch Creek Site (5JF463). At this site, also located immediately east of the Dakota hogback, Charcoal from a core sample yielded a radiocarbon age of 2830 ± 70 (2-sigma range of 1189-822 cal B.C.), indicating an early Late Archaic component. Additionally, an intact rock-lined hearth (Feature 1) was encountered in a backhoe trench and radiocarbon dated at 1980 ± 50 B.P. (2-sigma range of 60 cal B.C.- cal A.D. 131) (Gilmore and Baugh 1987). Later investigations uncovered two additional Late Archaic hearths; Feature 2 was radiocarbon dated at 2700 ± 90 B.P. (2-sigma range of 1024-610 cal B.C.) and Feature 7, from which a bulk soil sample was taken, yielded a date of 2100±60 (2-sigma range of 354 cal B.C.- cal A.D. 54). The latter feature was found in Backhoe Trench 3, where a large quantity of bison bone was also uncovered. In addition to flaked lithic tools, ground stone, and debitage, the Late Archaic component at the site included a corner-notched projectile point of the Magic Mountain type MM 20 (Jepson and Hand 1994).

Magic Mountain Site (5JF223). The Late Archaic period at the Magic Mountain site is represented by materials from the upper part of Zone C, which include type MM 17 (McKean-like) projectile points, but also medium-sized, side-notched (e.g., MM 20 and MM 21) and corner-notched (MM 23) types. Irwin-Williams and Irwin (1966) believe that Zone B and Zone A encompassed a late Apex manifestation of the terminal Archaic/early Late Prehistoric stage dating from about 2150-2050 B.P. Recent investigations support a transitional Late Archaic/Early Ceramic component, as demonstrated by three radiocarbon age determinations ranging from 1760 ± 50 B.P. (2-sigma range of cal A.D. 139-413) to 1930 ± 70 B.P. (2-sigma range of 50 cal B.C.-cal A.D. 45). Significantly, the two bracketing dates, 1760 and 1930 B.P., were obtained from charcoal and soils samples taken at the base of and immediately beneath Feature 11, a massive architectural feature. Feature 11 is a semicircular alignment of granitic and sandstone cobbles and boulders that has been interpreted to be part of a dwelling. The wall stretches 9 m across the

excavation block and was overlain by the remains of another large architectural feature. No posts or obvious postholes were identified. Though a few pieces of vertically set sandstone were encountered, the authors characterized the wall's constructions as an earthenworks type, where alluvial cobbles were set into a mound of soil, incorporating fortuitous bedrock elements. A single piece of probable daub was found above the level of the wall, which was constructed on bedrock of the Lyons Sandstone at a depth of 5.6-5.8 m below the site's datum.

Willowbrook Site (5JF6). As defined, this site contains three sheltered camps near Morrison. All are in a Fountain Formation outcrop of sandstone and face west. Excavated in 1963 by investigators from CU, investigators four natural levels were discerned at the most intensively occupied shelter. Level 1 was sterile, Levels 2 and 3 contained evidence for Late Archaic occupations, and Level 4 was associated with an Early Ceramic occupation. In addition to a rock-lined hearth type found in Level 3, the projectile point Types IIIA-D, from Levels 2 and 3, are all large, side-notched points. Charcoal from the two levels returned radiocarbon age estimates of 2040 $\pm$ 100 (2-sigma range of 362 cal B.C.- cal A.D. 216) from Level 2 and 2215 $\pm$ 75 (2-sigma range of 400-47 cal B.C.) from Level 3. Leach (1966) believed that the inverse dates reflect some probable rootlet contamination.

Van Bibber Creek Site (5JF10). This open camp sits on the south bank of the creek for which it is named. The site lies on Precambrian gravels between outcrops of Dakota Sandstone. Excavated in 1967, three zones (two preceramic and one ceramic) were identified. Zones B and C appear to contain cultural materials from Late Archaic times. A charcoal sample from the oldest preceramic Zone C produced a radiocarbon age estimate of 2140 $\pm$ 145 B.P. (2-sigma range of 480 cal B.C.-cal A.D. 196). Zone C contained charcoal and large bones, all split or pounded into small fragments but none charred. There were no hearths, only a few cobbles and isolated fire-cracked rock. In addition to a few flaked tools and ground stone, six projectile points of types designated A-C were recovered from Zone C. All are expanding stem, side-notched points with straight to slightly convex unground bases. Gunnerson (1987) notes that four of the points are comparable to type MM 20 points at Magic Mountain. Zone B at Van Bibber Creek contained a more clearly defined occupational level with two small rock piles of complete and fragmentary metates, most of which were fire blackened. While no hearths were found, the rock piles may represent stone boiling activities. Associated with Zone B is a corner-notched projectile point. Also recovered in addition to a few knives and scrapers, was a bone flesher made from the shoulder blade of a deer or elk and used for hide-working. Nelson (1969) compares the projectile point to Types B and C from Willowbrook and type MM 26 from Magic Mountain.

Cherry Gulch Site (5JF63). This site contains a midden of probably Late Archaic age that is composed of fire-blackened hearth stones. A few manos, metates, and ground stone fragments were found in the same levels as the midden. Associated with the midden were projectile point Types 6 and 6A specimens, with Type 5 specimens recovered in a level just beneath it. The points are believed to represent a cultural continuum. These points have been compared to type MM 18 points from Magic Mountain as well as to artifacts from Van Bibber Creek Zone 3, Willowbrook, and LoDaisKa. Immediately above the midden level, a couple of Type 7 points were found. Type 7 is an indented-base type that resembles a Duncan point, one that Nelson (1981) compared with artifacts of the Concho complex in Arizona. Still higher, immediately beneath the Early Ceramic levels at the site, are levels containing points of Types 8 and 9, which the author compared to types MM 20 and MM 33 from Magic Mountain, as well as to specimens from Van Bibber Creek and Willowbrook (Nelson 1981).

Bradford House II (5JF51). On the Ken-Caryl Ranch at Bradford House II, the Archaic levels yielded a wide variety of lithic tools, including bifaces, drills, scrapers, and a few retouched flakes. Also found were ground stone, including several manos of rhyolite and pestles (both unique to the Archaic assemblage) polished stone balls, and pigment. Late Archaic projectile points included three large side-notched and 11 triangular corner-notched, as well as a Park point. The latter, known from the Trout Creek area (Stewart 1970), is also found occasionally in Front Range sites, such as LoDaisKa (Johnson and Lyons 1997a), and rarely, on the plains. The Two Forks survey, a few miles south of the Ken-Caryl Ranch, also recovered a Park point (Windmiller and Eddy 1975).

Bradford House III (5JF52). At this site, investigators found three features dating to the Late Archaic. These include two hearths, both of which contained multiple cobbles, and a burial. Charcoal from the hearths returned radiocarbon age estimates of 1895 ± 55 B.P. for Feature 13 and 2725 ± 60 B.P. for Feature 17 (2-sigma range of cal A.D. 8-274 B.C. and 997-797 cal B.C., respectively). In addition to a wide range of flaked lithic tools and abundant ground stone for the Archaic period generally, more than 20 projectile points described as medium triangular bifaces with diagonal notches, and others affiliated with Late Archaic occupations at sites in the region were found. No bone tools were found in the Archaic levels at the site, but there was evidence in the Archaic and subsequent Early Ceramic levels for decoration: stones for grinding pigments, bone pendants, and amazonite (Johnson and Lyons 1997b).

The burial consisted of a flexed skeleton, placed on its left side with the head next to the shelter wall toward the east. The only grave goods were two metates that had been placed over the individual's skull (Medina 1975). A bone sample returned a radiocarbon age estimate of 2440 ± 185 B.P. (2-sigma range of 928-49 cal B.C.). The remains were identified as those of a male about 40 years of age. The individual had an atrophied right arm, which limited full use of the limb (Finnegan 1978).

Falcon's Nest (5JF211). The site is located in the southern portion of the Ken-Caryl Ranch. Investigators here noted a preponderance of deer represented in the faunal record and a commensurate lack of bison remains. This has been used to argue the diffusion of Woodland traits from the plains introduced to mountain-oriented Archaic bands (Adkins 1993:I). However, at the nearby Swallow site, there was evidence for bison use during Late Archaic times (Rathbun 1991). Also, at the Massey Draw and Dutch Creek sites (Anderson et al. 1994; Jepson and Hand 1994), located adjacent to the Ken-Caryl just east of the Dakota hogback, there is evidence for secondary butchering of bison. As the latter authors note, Massey Draw and Dutch Creek may have been part of a larger resource procurement area. It would have been no great feat for hunters with base camps in the hogbacks to process the meat near the actual kill sites and then transport the reduced resources back to base camps.

The only radiocarbon age estimate obtained that dates Late Archaic use of Falcon's Nest was 1990 ± 240 B.P. (2-sigma range of 753 cal B.C.- cal A.D. 591), from charcoal found in the cranial cavity of one of two burials at the site. This burial (Feature 11), found in the midden in front of the shelter, contained a generally intact individual in a flexed position. The burial was oriented northwest/southeast, with the head to the southeast. The body had been placed on its back and a sandstone slab had been placed over one shoulder. Over this burial was found a concentration of 23 rocks, which may have been a cairn, the top fill of the pit, or later depression fill (Adkins 1993:VI:4-5). The skeletal remains were later determined to represent those of a male, about 53 years of age (Finnegan and Kilgore 1997). A second burial, containing two individuals,

was later found at the site, somewhat upslope, but also in the midden area. This burial (Finnegan and Kilcore 1997) contained a 35- to 45-year old female and the limited remains of an infant 4 to 6 months old of indeterminate sex. The adult was generally flexed and placed on her left side, with her head to the north, facing east. The fragmentary infant remains had been placed over the adult's abdominal area. The burial pit was partially outlined by a series of cobbles and a metate had been placed over the adult's head. A projectile point found behind the adult's spinal column is believed to be part of the pit fill only. A bone sample from the woman specimen yielded a radiocarbon age estimate of 1100 ± 60 B.P., placing the burial in Early Ceramic times. However, based on its stratigraphic position, Adkins (1993:VI:5-6) argue that the burial is of Late Archaic affiliation.

Swallow Site (5JF321). At the nearby Swallow Site, evidence for Late Archaic occupations indicates increasing intensity of site use from earlier periods. Characteristic of these occupations are several neatly constructed hearths that have been described as basin-shaped rock-floored features, which are found in association with numerous large metates and scattered flakes and bone. Although deer bone is predominant at the site, several fragments of bison long bone were also found, leading investigators to conclude that if bison was consumed at the site, butchering occurred elsewhere (Rathbun 1991). Blood residue studies supported the conclusion of off-site butchering. A total of 189 lithic tools was analyzed for blood residue. Marlar et al. (1998) found that although there was a paucity of bison bone at the site, bison was represented in the specimens of the blood residue sample as often as deer, and that during the Late Archaic and Early Ceramic (Woodland) periods, bison was a primary food source. Two charcoal samples returned radiocarbon age estimates for Late Archaic occupations at the site: 1880 ± 90 B.P., a calibrated date of A.D. 130 (2-sigma range of 45 cal B.C.- cal A.D. 244) for Feature 17 , a primary flexed burial that has not yet been analyzed; and 2390 ± 70 B.P. (2-sigma range of 45 cal B.C.- cal A.D. 244 and 769-263 B.C.) respectively from the general level at 1.7-1.8 m in depth (Rathbun 1991; Rathbun and Hammond 1995; Hammond and Rathbun 1997).

The Window Rock Site (5DA306). This site is one of 39 prehistoric sites identified by CAS volunteers in a 1978 survey of Roxborough State Park. The survey was undertaken by the OSAC in cooperation with the Colorado Division of Parks and Outdoor Recreation. Several of the sites in the park, now designated Roxborough Archaeological District, contained artifacts diagnostic of occupation of the area from Early Archaic through Early Ceramic times. The Window Rock site is an open camp overlooking Willow Creek. Its topographic setting is similar to that of several hogback sites e.g., Magic Mountain, Twin Cottonwoods on the Ken-Caryl Ranch, and a site (K:12:13) located immediately north of the present park boundary that was tested by Alan Olson of the DU in the early 1970s. All of these sites are located on south-facing slopes of the Lyons hogback at water gaps. At the time of the inventory, it was noted that an extensive gully had cut through the Window Rock site, exposing several stone-lined hearths, at depths of as much as a meter. The survey crew recovered a Duncan-type projectile point at a depth of 0. 8 m in the cutbank on the lower slope of the site and, a perforator and a small corner-notched point with serrated blade from the site's surface (Tate 1979). The latter point is similar to the type MM 34 from Magic Mountain site (Irwin-Williams and Irwin 1966). Over the years, unfortunately, several of the hearths eroded were lost. However, in 1988, fill from two of the hearths was salvaged by OSAC. A charcoal sample taken from a hearth (Feature 3) returned a radiocarbon age estimate of 1970 ± 50 B.P. (2-sigma range of 50 cal B.C.- cal A.D. 136), dating what appears to have been an extensive occupation during the Late Archaic period. Similarly, the sample from another hearth (Feature 1) returned an age estimate dating an Early Ceramic component.

In addition to the Two Forks and Roxborough State Park inventories (Windmiller and Eddy 1975; Tate 1979), large surveys were conducted just east of the Dakota hogback for Chatfield Reservoir and Highlands Ranch (Nelson 1979; Burney et al. 1979). All of these inventories yielded artifacts from the various Archaic periods.

Dancing Pants Shelter (5DA29). At this sheltered camp, evidence for Late Archaic occupations was found in a small group of basin-shaped hearths (Features 1, 2, and 22). Charcoal from the youngest of the three, Feature 2, returned a radiocarbon age estimate of 1820 ± 60 B.P. (2-sigma range of cal A.D. 75-383), and samples from Features 1 and 22 returned age estimates of 1960 ± 60 B.P. and 1980 ± 100 B.P. (2 sigma cal. ranges of 59 cal B.C.- cal A.D. 217 and 196 cal B.C.- cal A.D. 310, respectively). The latter also contained fire-cracked rock, interpreted by Liestman and Kranzush (1987) as possibly the remains of a disturbed slab- or rock-lined hearth. Feature 1 contained a wide variety of macrofloral materials including remnants of pine, fir, ground-nut, kinnikinnick, ball cactus, raspberry, willow, spiderwort, and violet. A large corner-notched projectile point, one of three from the site, was found near Feature 1. Both this hearth and Feature 2 are also associated with several bones from large mammals, some of which are burned.

Mountains

In the mountains, the number of sites with radiocarbon-dated Late Archaic occupations is greater than that of the preceding period, exceeding even that of sites with Early Archaic occupations. Most of the sites are multicomponent camps (i.e., the Joe Wright Site [Morris and Marcotte 1976a], Coney Lake [Benedict 1990], and 5PA153 [Schubert et al. 1981]; one, Bode's Draw (Benedict 1993), is a floral and faunal processing site. One site, Blue Lake Valley (Benedict 1979b), is a single component hunting blind and two others are the Flattop Mountain and Trail Ridge game drives, discussed earlier. The remaining two sites, 5LR549 and 5PA415, are isolated hearths.

Joe Wright Site (5LR220). An intermittently occupied open camp, the site is situated on and between several glacial moraines in Joe Wright Creek valley northeast of Cameron Pass, one of the lower passes between the Laramie Range and North Park. Investigators found evidence of occupation during both the Late Archaic and Early Ceramic periods. The site yielded four features, consisting of three hearths and a concentration of bone and charcoal. A variety of flaked lithic artifacts was present. The tools included bifaces, end and side scrapers, a chopper, and preforms. The basal stems of two large, corner-notched Late Archaic dart points were found in association with one of the hearths. A charcoal sample from this hearth, Feature 4, returned a radiocarbon age estimate of 2000 ± 60 B.P. (2-sigma range of 158 cal B.C.- cal A.D. 130) (Morris and Marcotte 1976a).

Blue Lake Valley Site (5BL141). This open architectural site consists of a single stone circle located in a swale at the head of South St. Vrain Creek, above timberline in the Indian Peaks Wilderness Area. The circle is made of monzonite boulders. The site assemblage contained five butchering tools that were resharpened on site, including four bifacial cutting/scraping tools and a reworked corner-notched projectile point with an expanding stem and irregular base. Benedict (1979a compares the point to a type from the Porcupine Peak site (5ST98) based on discussion with its investigator, J. Marcotte, and others found at Medicine Lodge Creek in central Wyoming (Frison 1978, 1991a). Also present was a unifacial scraper, debitage, and a smoothed pebble, similar to those found at Coney Lake (5BL94) and Caribou Lake (5GA22), where they are found

in Late Archaic and Early Ceramic components (Benedict 1985a,1990). A wood sample from a buried humus layer found in association with most of the flakes returned a radiocarbon age estimate of 3215 ± 90 B.P. (2-sigma range of 1682-1266 cal B.C.). The inferred function of the

site was a blind where Late Archaic hunters waited to ambush animals that were driven along a corridor between the spruce-fir krummholz and an existing snowfield (Benedict 1979b).

Coney Lake (5BL94). At this site, evidence was found for two Late Archaic occupations. The earliest is an unidentified occupation manifested in a basin-shaped hearth, Feature C, charcoal from which returned a radiocarbon age estimate of 1805 ± 90 B.P. (2-sigma range of cal A.D. 22-426). No diagnostic artifacts were associated with the occupation, only a few flakes of Table Mountain jasper and Kremmling chert, and the hearth was overlain by charcoal from a younger hearth, Feature G. The second occupation, tentatively identified with the Late Archaic, is marked by a group of Coney Lake Corner-notched dart points generally associated with Lithic Workshops V and VI. Some of the points were found in association with Hearth G, charcoal from which yielded a radiocarbon age estimate of 1585 ± 80 B.P. (2-sigma range of cal A.D. 262-645) Benedict (1990) offers two interpretations. The radiocarbon date may reflect the time of occupation, a time just before introduction of the bow and arrow, or it is equally likely that the points were discarded in Late Archaic times on an eroded surface, buried and frost-sorted upward, and later blanketed with charcoal from the hearth. Hundreds of flakes were found in Workshops V and VI, the vast majority of them Kremmling chert. All 12 of the Coney Lake points are also of this material. Some biface knives were present, as well as and large numbers of flakes used for scraping; in fact, miniature utilized flakes seem to characterize the assemblage. This component is seen as representing a camp where hunters arrived from the west after successful hunts, bringing ready-made tools with them. The breakage evidence on the points found at the site occurred elsewhere, with added breakage and edge damage caused by secondary use as hafted butchering tools, either at the camp or at primary butchering stations. Some butchering and hide preparation occurred at the camp. (Benedict 1990) believes that the Coney Lake Corner-notched dart points, characterized by elongate stems and convex bases, may be ancestral to the Hog Back Corner-notched arrow points also found at the site.

Bode's Draw Site (5LR1370). This multicomponent processing locale is located in the upper montane forest, on an alluvial fan at the margin of a spring-fed wetland in Bode's Draw. The site is beneath the Bode homestead and a pig farm, and was discovered eroding from a road cut. There Late Archaic, Late Prehistoric, and Protohistoric components are present. The Late Archaic component is found in Area B and includes Features 2 and 4. A radiocarbon age estimate of 2270 ± 80 B.P. (2-sigma range of 481-112 cal B.C.) was obtained for Feature 4, a large slab-lined oven. Feature 2, an associated pile of thermally oxidized rocks, was probably cleaned out from Feature 4. While no diagnostics were recovered, artifacts in Area B included a lithic scraper and utilized flakes, a bone awl and long bone hide-scraping tool, numerous sandstone grinding slab fragments, and debitage. The area provided evidence for plant and animal food roasting, bone marrow processing, hide processing, and sewing. It is inferred to have functioned as a multi resource processing locale near an unknown camp (Benedict 1993).

Site 5LR549. This site contains the remains of a rock-lined hearth exposed in a road cut. Associated with the hearth were 10 nondiagnostic artifacts of quartzite, chert, and gneiss, and several bone fragments from a large mammal. One is an ungulate, possibly bighorn sheep, mandible (Gordon and Kranzush 1978). A charcoal sample from the hearth processed subsequent

to the submittal of the report, yielded a radiocarbon age of 2040 + 85 (2-sigma range of 348 cal B.C.- cal A.D. 136); however, no diagnostic artifacts were recovered.

In North Park and South Park, the survey of Lischka et al. (1983) found 41 Late Archaic components, of which 20 were single component sites. Artifacts associated with these sites included several corner-notched points, often ground on their basal edges. Several other surveys in and around North Park have also yielded corner-notched points of the period (Metcalf et al. 1980; Friedman 1987; Arbogast 1991; Rupp 1990a, 1990b, 1995; Harrison 1995; Bonnifield 1996). Several inventories in South Park have also yielded corner-notched dart points diagnostic of Late Archaic occupation (McPherson and Grett 1987; Hibbets 1987; Tate 1995b, 1995c; Harrison and Tate 1998a).

Site 5PA153. This is a small open camp situated on an interfluvial ridge in the mountains below Mosquito Pass above South Park, one of very few sites in the area that have been radiocarbon dated. The site was identified during an inventory for a transmission line that was conducted by the Laboratory of Public Archaeology (LOPA) at CSU in 1978 and subsequently tested in 1980. Eight artifacts, including two projectile points and a fragment of a clay pipe, were found on the surface. Although no features were noted, testing at the site produced a suite of radiocarbon dates derived from flecks of charcoal taken from the excavated levels. The earliest radiocarbon age estimates for the site are 1760 ± 190 B.P. from Level 4 and 3200 ± 655 B.P. from Level 8 of Test Trench 1 (2-sigma range of 45 cal B.C.- cal A.D. 620 and 3303 cal B.C.- cal A.D. 125, respectively). The latter date is considerably earlier than the remaining age estimates, most of which date an Early Ceramic occupation. Because some of the age estimates are chronologically superimposed in terms of their stratigraphic levels, the investigators concluded that postdepositional disturbance with resultant vertical mixing had occurred at the site. Artifacts include three fragmentary stemmed and shouldered projectile points with slightly concave to concave bases, which Schubert et al. (1981) found not very helpful in determining cultural/temporal affiliation; the points resemble both early types from the Hungry Whistler Site (Benedict and Olson 1978) and several from Front Range Early Ceramic (Woodland) sites. Debitage at the site was mostly chert and only thinning and retouched flakes were present. There was no evidence for toolmaking; finished or partly completed tools were apparently carried in to the site, possibly because there was no immediately available local tool stone. Two reworked points lend support to this observation. Most of the tools had low edge angles, suggesting meat processing. The site is free of snow in midsummer, but no ground stone or evidence for vegetal processing was found. Neither was any bone found, possibly a result of acidic soils and poor preservation conditions. Schubert et al. (1981) concluded that while some of the artifacts at the site pointed to a Woodland occupation, the suite of radiocarbon dates suggested a somewhat earlier occupation, most likely during terminal Late Archaic/Early Ceramic times.

Site 5PA415. A basin-shaped hearth, the site was encountered in the cutbank during a CDOH project that involved the widening of U.S. Highway 285 between Foxton Road and Kenosha Pass. Charcoal from the hearth yielded a radiocarbon age estimate of 2920 ± 90 B.P. (2-sigma range of 1393-847 cal B.C.). A single quartzite flake was found in association with the feature. No diagnostic artifacts were present (Gooding 1986).

Summary and Conclusions

Twelve sites on the plains with have been radiocarbon dated to the Late Archaic period. Most of these sites are open camps, but there are also two sheltered camps, a bison kill, and a burial; the latter is one of three radiocarbon dated to the period. The plains campsites of the Late Archaic, like those of the preceding period, are characterized by numerous rock-filled and occasionally slab-lined hearths, a wide variety of lithic and bone tools and ground stone. Use of ocher and hematite is also occasionally seen, as in the previous period. All of the sites have corner-notched dart points; at one site such a point is compared to the Besant style of the Northern Plains. Bison and artiodactyl remains are found at most of the camps, the latter commonly identified as pronghorn or deer. Rabbit is also an important faunal species in these sites. Plant remains include seeds, such as goosefoot, and PET remains, such as charred cactus parts.

Fifteen sites have absolute-dated Late Archaic occupations in the hogbacks/foothills. As with the Middle Archaic period, these include both open and sheltered camps, and butchering sites. One burial is firmly dated to this period, another is dated to the Late Archaic/Early Ceramic transition, and two others that although radiocarbon dated may actually be either Late Archaic or Early Ceramic in age. Additionally, undated human remains were found scattered at another two other sites with both Archaic and Ceramic occupations. The Late Archaic occupations are evidenced by numerous, often carefully constructed, hearths, lithic and bone tools, ground stone, and occasional gaming pieces and decorative items, such as ocher, bone beads and pendants, and amazonite. Corner-notched dart points are characteristic, but not exclusively, of these occupations and include types such as Pelican Lake. The stemmed Park point is also found. The camps' faunal assemblages are often dominated by deer, but generally include bison, as well as other animals. Significant use of bison is supported by blood residue analysis of lithic tools at campsites. Bison dominated the faunal remains at two butchering sites, but deer, mountain sheep, and pronghorn were also represented. A few of the sites also produced considerable evidence for use of plant foods, including a variety of seeds, berries, cactus, and pine nuts.

In the mountains, the number of radiocarbon-dated sites of Late Archaic occupation, nine in all, is significantly higher than that of the preceding period and exceeds the number of sites with dated Early Archaic occupations. The sites include open camps, a plant and animal processing site, a hunting blind, two game drives, and isolated hearths. With the exception of the latter, the sites are characterized by hunting and butchering tools and contain corner-notched points, which are often reworked. Most of the sites had intact hearths but little in the way of faunal remains, a common finding in mountain sites where soil conditions militate against bone preservation.

THEORETICAL CONSIDERATIONS

Theoretical considerations necessarily begin with an analysis of differences in the archaeological record by subarea, from which follows a discussion of cultural process and its relationship to the theoretical realms pertinent to Archaic occupation in the area. Finally, the research questions of the earlier prehistoric contexts for the mountains (Guthrie et al. 1984) and plains (Eighmy 1984) are addressed, and current needs or data gaps are identified.

Research Topics

A comparison of archaeological data for the two major areas of the Platte drainage, plains and mountains, and the intervening transition zone, the hogbacks/foothills ecotone, reveals both similarities and differences in matters of chronology, settlement, subsistence, and technology, and paleoenvironment, and paleodemography. These research problems, among those suggested in the theoretical section, are addressed below.

Chronology

In past efforts, 5500 B.C. was used a starting date for the Archaic in the mountains (Guthrie et al. 1984) and 5000 B.C. was the beginning date for the plains (Eighmy 1984). Guthrie et al. (1984) used A.D. 500 for the end of the stage in the mountains, and Eighmy (1984) proposed an ending of 1 B.C. for the plains of eastern Colorado. However, the current archaeological record indicates that the Archaic stage appeared as early as 7800 B.C. in the mountains and by 6400 B.C. on the plains, according to Black (1990). (B.C. and A.D. dates have been used in to the chronologies of the authors cited here who are prominent in the literature of the study area.) Within the Platte River study area, available data support a more conservative date of no earlier than 7500 B.P. for the onset of the Archaic stage. Currently, the earliest radiocarbon-dated feature with associated Early Archaic artifactual material are the age estimates of 6450 B.P. (2-sigma range of 5575-5146 cal B.C.) from the Ptarmigan Site (Benedict 1981) and 7170 $\pm$ 60 B.P. (2-sigma range of 6121-5876 cal B.C.) from the Swallow Site (Hammond and Rathbun 1998). However, it is also likely that an age estimate of 6910 $\pm$ 50 B.P. (2-sigma range of 5850-5638 cal B.C.) from the Willow Bunker Site (Overturf and Feiler 1998) documents an Early Archaic occupation. Table 2 in the Appendix lists radiocarbon dates for the Archaic stage in the Platte River Basin. Table 5.1 compares the bracketing dates for the three periods proposed by Guthrie et al. (1984) and Eighmy (1984) with present findings.

Table 5-1. Comparison of Bracketing Dates for the Archaic Periods

Archaic Period	Plains (Eighmy 1984)	Mountains (Guthrie et al. 1984)	Platte Context (Tate)
Early	5000 B.C.-3000 B.C.	5500 B.C.-3000 B.C.	7500 B.P.-5000 B.P.
Middle	3000 B.C.-1000 B.C.	3000 B.C.-1000 B.C.	5000 B.P.-3000 B.P.
Late	1000 B.C.-1 B.C.	1000 B.C.-A.D. 500	3000 B.P.-1800 B.P.

Black (1995) has proposed an end date for Archaic presence in the mountains of A.D. 150, a date that is compatible with the findings of Butler (1986) and Brunswig (1996) for the onset of the Early Ceramic period on the plains and with the 1800 B.P. (A.D. 150) date used here for the end of the Late Archaic period, as well. This is somewhat earlier than Guthrie et al.'s (1984) estimate of A.D. 500 for the mountains and later than Eighmy's date of 1 B.C. However, no transition from one stage to another or one period to another for that matter occurred in a given calendar year. Cultural traits overlap temporally and there are the expected problems with interpretation, as well. In the Platte River study area, for example, site components or occupations

both in the mountains and on the plains have artifacts that are McKean or McKean-like, but the associated radiocarbon dates, which site investigators are confident are reliable, indicate occupation during the period traditionally assigned to the Early Archaic. Such instances occur at the Front Range Fourth of July Valley Site (Benedict 1981), where the predominant diagnostic artifacts are viewed as transitional from late Paleoindian to McKean, and Albion Boardinghouse site (Benedict 1975a), where Mallory-like, side-notched points appeared in a context that is dated at 5730 ± 145 B.P. (2-sigma range of 917-4266 cal B.C.). On the plains near the edge of the foothills, at the Rock Creek site, Gleichman and Karhu (1997), found a typical Duncan point on the edge of a hearth dated to 5690 ± 64 B.P. (2-sigma range of 4712-4763 cal B.C.). The vast majority of Middle Archaic absolute-dated components, however, fall in the 3000-5000 B.P. range.

There are also problems in discerning the end of the Late Archaic period, and thus, the end of the Archaic stage (see Black [1995] for a discussion of the period's chronology in the mountains). In all three subareas, this is mainly an interpretive problem caused by radiocarbon-dated sites that lack diagnostic artifacts or contain diagnostics for two periods, Late Archaic and Early Ceramic, in the same contexts. If the date for the earliest appearance of Early Ceramic traits is used, then a date of 1800 B.P (A.D. 150) can be used for the end of the Late Archaic period with the understanding that certain traits persisted. It is possible, even likely, that the two diagnostic weapons systems, atlatl-dart and bow-arrow actually overlapped in periods of use, at least for a few hundred years. An atlatl weight was among grave goods in the Early Ceramic Aurora Burial (Guthrie 1982). However, as Kalasz and Shields (1997) have found at Magic Mountain, it may simply reflect later reuse of dart points as hafted knives by people of the Early Ceramic period. Also, in some instances where sites have been radiocarbon dated to a time traditionally considered to be Early Ceramic, investigators have interpreted the sites or components to be Late Archaic in the absence of ceramics. On the plains, these include components at 5AH741 and 5AH416 (Graham 1998; Kalasz et al. 1996). In addition, Cassells and Farrington (1986) believe they have pottery in radiocarbon-dated context of 2140 ± 200 B.P. at site 5BL876

Settlement Patterns

Settlement patterns are seen as the distribution of archaeological sites on the landscape. This distribution reflects the movement of human populations as they seek the resources necessary to maintain their lifestyles. Survey records can provide information on where habitations and other sites are located for specific periods, and though theoretically possible, the reality is somewhat different. Two major problems occur with survey data: sampling bias and a lack of diagnostic artifacts at most sites. Probably no more than 2-3 percent of the area has been surveyed for cultural resources, and the surveyed areas were generally not randomly selected but chosen for a variety of reasons, such as project locations, access, and archaeological potential. Also, in the Platte River Basin, between 61 and 92 percent of archaeological sites by county are of undetermined cultural/temporal affiliation, owing to a lack of diagnostic artifacts.

Habitation sites on the plains of northeastern Colorado are prevalently open camps, but there are also open architectural sites, stone circles, and occasional rockshelters. The open camps are usually found on terraces and ridge tops. The camps include both short-term hunting and gathering camps and occasional base-type habitations of longer use, such as were likely at Wilbur Thomas Shelter (5WL13) and Dipper Gap (5LO101), both sheltered locations. The prime environmental variable affecting habitation locations is access to water. Seasonality of occupations, where such has been determined, is generally attributed to spring and/or fall

occupations, based on faunal remains and macrofloral analysis of hearth fill. Just one Archaic kill site is known on the plains; the site was found on a terrace of the South Platte River (Morris and Kainer 1975). However, game drive lanes and/or cairn lines can be found anywhere with sufficient topographic relief. Some of the latter are known on the High Plains near the Wyoming border, but they are undated (Harrison and Tate 1998b) The original context of the two Archaic burials from the Colorado plains is poorly known. One was uncovered during house construction; the other during feedlot operations. However, both are reported to have been flexed burials. One of these, the Witkin Burial, contained grave goods, as did the Sidney Burial in the Nebraska Panhandle, unlike most of the burials dated to Archaic times in the study area.

In the hogbacks/foothills, a great number of rockshelters are found, numerous open camps as well. In this subarea, the frequency of seasonal base camps, hypothesized for winter and spring use is far higher than is known in either the mountains or plains. The depth of cultural debris, particularly in the rockshelters argues for use as base camps. Winter occupations are suggested both by the prevalence of camps in southwest-facing shelters with high solar radiative properties, the diversity of cultural materials, and the only presence of storage and dwelling-type architecture known in the Platte River area for the Archaic. Absolute-dated Archaic architecture is thus far confined to the following features: a lean-to at the Dancing Pants sheltered camp (Liestman and Kranzush 1987), a small stone cist at the Bradford House III sheltered camp (Johnson and Lyons 1997b), and the massive stone wall that dates to the Late Archaic/Early Ceramic transition, found at the Magic Mountain open camp (Kalasz and Shields 1997). Open camps in the hogbacks/foothills are likely to be found on saddles between hogbacks and near water gaps where streams leave the mountains before entering the plains. The two Archaic butchering sites known in this subarea are located along streams that have just exited the hogbacks (Anderson et al. 1994; Jepson and Hand 1994). Two drive lines with cairns (5JF962 and 5JF966) are reported from Table Mountain and stone fences are known from Mount Morrison and Roxborough State Park (Johnson et al. 1997; Rathbun 1978; Tate 1979); they are, however, undated. All of the Archaic burials known in the hogbacks/foothills subarea were found within habitation sites, both open and sheltered camps. Where the burial technology is known, the evidence indicates that Archaic burials were placed in a flexed position, often in prepared pits with few or no accompaniments. Frequently, however, a metate or other stone was placed over the head or a cairn of stones was erected on top of the filled pit.

Known habitation sites in the mountains subarea of the Platte River Basin are mainly open camps and occasional stone circle sites. At the higher elevations, these sites are predominantly short-term hunting camps. Along the Continental Divide, they are often directly associated with game drives/kill localities, which are numerous, and butchering sites. Often they are located in protected valleys nearby. Although some evidence of gathering of plant foods is evident in these sites, the primary activities at these sites are tool maintenance and repair, and faunal processing.

Architectural sites such as tipi rings are generally situated in open topography, and can be found in all three subareas. Lischka et al. (1983) found two types of base camps in North Park. Open camps are found at relatively low elevations near water in areas of plentiful plants and small game and stone circle sites are seen on ridges or high terraces at greater distance to water in areas with plentiful wild plants and large game. Some of the latter were postulated to be winter bases. There are known ceremonial sites in the Mountains subarea. In addition to sites such as Old Man Mountain (Benedict 1985b), there are fasting beds or vision quest sites, usually located on ridges

or high prominences. The cultural/temporal affiliation of these sites, however, is generally not known.

Although the potential exists for complex architectural habitation sites, such as the winter occupation pithouses and surface mud-and-stick buildings described by Black (1990), none dating to the Archaic are yet known for the Platte River drainage basin.

Subsistence

Subsistence strategies are marked by activities and technologies used to obtain the resource needed for survival (Earle 1980). In hunter-and-gatherer populations this often involves seasonal rounds and in the Platte River Basin, these movements also were frequently characterized by transhumance, or elevational moves based on the seasonal availability of plant resources. The mechanisms of seasonal rounds and transhumance patterns for the Platte River drainage area are not well understood. Several transhumance models have been proposed for use of the mountains: the up down or piston engine proposed for the Altithermal Mount Albion peoples (Benedict and Olson 1978; Benedict 1979a) and the grand circuit or rotary engine models (Benedict 1990), both for seasonal use of the mountains by those who wintered in the hogbacks/foothills east of the Front Range; and the forager-collector continuum model, entailing seasonal use of the higher elevations by Mountain tradition peoples were winter-based at relatively lower mountain locations (Metcalf and Black 1997; Black 1991). It is, of course, unlikely that these explanations exhaust the full range of options available to prehistoric populations in the area. Johnson et al. (1997), for example, argue that groups occupying the southern portion of the Front Range eastern hogbacks and foothills would have had easier access to the mountains by following the South Platte River to South Park, rather than by following a simple up down model or the route of the grand circuit model.

Subsistence data from sites overall are relatively sparse. However, the situation is improving by increased emphasis on painstaking analysis of floral and faunal remains and the recent application of techniques, such as pollen washing of ground stone implements and blood or protein residue analysis, of both flaked lithic artifacts and floor samples.

On the plains, bison was a dominant game animal throughout most of prehistory, although evidence from the Early Archaic period is limited to that found at the Hutton-Pinkham site (Larson et al. 1992). A recent analysis of presence/absence of five genera (bison, deer, pronghorn, elk, and rabbit) was undertaken by Butler (1997a) using data from a limited number of sites in the plains and hogbacks/foothills of eastern Colorado. This study indicates a general lack of bison on the plains during the Altithermal. During the Middle Archaic period, the percentage of bison and deer were equal. However, in the Late Archaic, deer surpassed bison, and rabbit was an even higher percentage than either of the larger game animals, leading to the conclusion that the number of bison present on the plains during the latter period was not great. The only known kill site is the Merino site (Morris and Kainer 1975), where bison were ambushed at a spot along the South Platte River. Based on the age range of the faunal collection, the event occurred in late fall or winter. Numerous smaller animals, particularly rabbit and prairie dog were also used for their meat. The faunal assemblages at camps also include smaller rodents and occasional birds, canids, and freshwater snails. There is evidence at the Rock Creek site for intensive processing of bone both for bone marrow extraction and grease manufacture (Gleichman et al. 1995).

Charred seeds, such as those of goosefoot, pigweed, bulrush, cocklebur, rose, and grasses are relatively common in hearths at plains campsites. Macrofloral and pollen studies from these sites indicate that numerous seeds were ground and/or roasted and that starchy roots, such as biscuitroot or bitterroot found at 5AH741 (Graham 1998), berries, and cactus parts were prepared for food consumption as well. The Early Archaic occupation at Monaghan Camp also provided limited evidence for use of alumroot, possibly for medicinal purposes (Tucker 1990). Numerous, stone-filled hearths and occasional, slab-lined hearths are found in the camps, as is a variety of flaked lithic, bone, and ground stone tools related to faunal and floral processing.

In the hogbacks, deer, rabbit, and bison are most often represented in faunal assemblages at camps, but elk, bighorn sheep, and to a lesser extent, pronghorn have been reported. At LoDaisKa, for example, deer bone comprised 75 percent of the total collection, but bison and small game were sparsely represented. At Falcon's Nest, deer was also the dominant species (Adkins 1993). However, protein residue analysis of four of five artifact and floor samples from Archaic levels at Magic Mountain were positive for bison (Kalasz and Shields 1997). At the Swallow site, though deer bone was dominant, blood residue analysis of 189 artifacts found positive reactions in equal numbers for bison and deer, concluding that by Late Archaic times, bison was a primary food source (Marlar et al. 1998). Bison were the dominant species butchered at the Massey Draw and Dutch Creek sites. Based on the presence of fetal bone at Massey Draw, late spring was inferred to be the time of the kills (Anderson et al. 1994; Jepson and Hand 1994).

Plant food remains at hogbacks/foothills campsites, as on the plains, provide evidence for use of seeds several species, such as goosefoot, pigweed, sunflower, hedgehog cactus, and rose; acorns and pine nuts; several berries and fruits, such as plum hackberry, and raspberry; and parts of other plants that include dandelion, mallow, spiderwort, violet, kinnikinnick, and ball cactus. There is also evidence for use of willow and sedges. Of particular interest are the specimens of Chapalote-type *Zea mays* found in the early occupational levels at LoDaisKa (Irwin and Irwin 1959). Although the stratigraphic context is somewhat questionable because of to site disturbances, the presence of the species implies growing or importing of corn from the Southwest sometime in the site's history. Corn pollen from LoDaisKa could not be positively identified. Corn pollen found in the lower levels of the Crescent site has been attributed to recent rodent disturbance. Also found in a pollen column at the latter site was a single egg (Sample 19, Level 15–Middle Archaic) of a human parasite, suggesting that human populations there were infected with whipworm (Cummings 1997).

The subsistence pattern described for sheltered camps on the Ken-Caryl Ranch is probably typical for sites in the hogbacks/foothills subarea. It appears that bison were butchered near unknown kill sites, probably outside the hogbacks to the east, and selected elements were brought back to camps in the hogbacks, but deer, mountain sheep, pronghorn, and small game were brought back whole for processing on site. Bone at the sites was heavily fragmented; grease marrow extraction was a common activity, unlike at the Massey Draw site (Anderson et al. 1994), where there was no evidence for bulk processing. Evidence for stone boiling is seen in discard areas of amorphous, thin layers of fire-cracked rock with little associated charcoal at these sites (Johnson et al. 1997). Gathering and processing of plants was also an important economic endeavor, manifested both in the great quantities of ground stone at these sites and by the presence of storage pits, at sites such as Bradford House III (Johnson and Lyons 1997b) and LoDaisKa (Irwin and Irwin 1959), some of which still contained vegetal remains when found.

Faunal collections from mountain sites are extremely sparse and fragmentary due primarily to poor preservation in thin acidic soils. The best evidence at these sites for subsistence practices comes from features and artifacts. At high elevation, along the Continental Divide, there are dozens of game drives with stone walls, cairn lines, and blinds (see Benedict 1985a, 1990, 1996 and Benedict and Olson 1978). These provide evidence for collective hunts of game animals, likely elk and bighorn sheep. The season for these hunts was late summer and fall based on the snow-free times available at their locations. By their very abundance, deer, may have been the dominant quarry in the mountains, although not necessarily at the game drives. Bison are also known from the mountains, particularly the parklands. Associated with the game drives are camps, which evidence wide arrays of hunting/butchering and processing tools. At these sites, hearths and sometimes roasting pits are found.

The archaeological record for floral remains in the mountain sites is equally sketchy. However, vegetal processing is inferred from camps such as 5BL70 (Benedict and Olson 1978), which contained a cobble-filled hearth and relatively abundant ground stone, and Bode's Draw (Benedict 1993), where ground stone and a large, slab-lined hearth were found.

Outside the Platte River Basin, in the upper Colorado River basin, the Yarmony Pithouse site (5EA799) provides evidence for year-round occupation and food storage. Here, investigators found that rabbits and hares, elk, deer, and perhaps bison, were primary food sources in Archaic times, supplemented by various other species. The faunal collection from the site provides evidence for intense processing of bone for marrow, grease, and soup. Macrobotanical remains included at least six taxa: prickly pear, goosefoot, cherry, probable skunkbush, pine, and juniper; the latter two probably represent fuel remnants. Pollen washes of ground stone indicate that grasses and sagebrush were also food sources (Metcalf and Black 1991). No architectural habitation sites with evidence for year-round occupation are presently known from the Platte River Basin during the Archaic, although Lischka et al. (1983) have postulated possibly winter occupation for some stone circle sites in North Park.

Technology

Several tool complexes have been identified from excavations of sites, most of which were found in dated occupational levels. The older group of these complexes is characterized by large side- and corner-notched projectile points. In the hogbacks and plains, where the Magic Mountain and Mountain complexes were identified and in the mountains where the Mount Albion Complex was defined. Also, in the mountains, throughout the Archaic stage are projectile points identified with Great Basin origins (see Black 1991), such as those of the Pinto and Elko series. In the Middle Archaic period, in addition to a continuation of some of the earlier types, the McKean Complex, named for the type site on the High Plains in eastern Wyoming, was introduced and subsequently diffused throughout the Platte River Basin study area. The Apex complex at Magic Mountain was also defined for Middle and Late Archaic occupations. By Late Archaic times, a variety of side-notched dart points is predominant at sites throughout the area. Many of these are also comparable to Northern Plains types, such as Pelican Lake and Besant. The Coney Lake corner-notched points may also date to the Late Archaic period.

The Magic Mountain Complex, defined for Early Archaic occupations at the best known of numerous hogback sites, Magic Mountain, is characterized by several projectile points: the unnotched types MM 1 and MM 2 and most notably, the notched MM 3 and deeply corner-notched

MM 4. The basic technological method is prismatic flakes made from prepared subconical cores. In addition to projectile points, prismatic flakes were converted to microscrapers, knives, and gravers. Many evidence heat treatment. Most of the scraping tools are end scrapers. Unifacial and bifacial perforators, drills, ovoid bifaces, scraper-planes made on cores, and a few types of choppers, including large pebble, bifacial, and core tools were reported. There were also a number of grinding slab types (Irwin-Williams and Irwin 1966:178-179).

The Mountain Complex was defined at the Wilbur Thomas Shelter (Grady 1971). Artifacts affiliated with the Mountain Complex are described as similar to those of the Mummy Cave and Sorenson sites in the Middle Rocky Mountains. The large, side- and corner-notched points are also considered comparable to those of the hogbacks Magic Mountain site, specifically to the types MM 3 and MM 4 of the Magic Mountain Complex and also to the type MM 22 of the subsequent Apex complex, as were stone-filled firepits.

Points of the Mount Albion Complex are shallow corner- or side-notched artifacts with convex bases and asymmetrical blades; almost all are of quartzite or argillite. The complex is defined by poor-quality rocks, basal and notch grinding, secondary use as hafted butchering tools, and a diverse tool assemblage that includes ovoid bifaces, end scrapers, backed knives, flake gravers, microtools, sandstone milling slabs, and cobble handstones with beveled secondary surfaces (Benedict and Olson 1978).

Technology of the Mountain tradition is described as frequent use of split cobble core reduction strategy and subsequent split cobble tools, especially in the early periods; heavy use of microtools, especially after 6000 B.P.; and divergent projectile point styles resembling those of the Great Basin (Black 1991). Projectile points are large unstemmed, stemmed, and side-notched types that are relatively thick, with biconvex longitudinal cross sections and collateral flaking patterns. Edges are commonly serrated. Hafting element notches and edges are not usually ground. The bifacial reduction sequence is commonly used; however, many points are made on flakes. Points recovered at the Yarmony Pithouse site in association with the Early Archaic occupations were predominantly stemmed, indented-base points resembling those of the Pinto series of the northern Colorado Plateau. Metcalf and Black (1991) assert that the Yarmony points are distinct from the McKean complex in age and flaking patterns, and have rounded basal corners and serrated blades. Gleichman and Karhu (1997) note, however, that these morphological characteristics are present on McKean points from the hogbacks.

The hallmark of the Middle Archaic period, the McKean complex is known from several dart points: the McKean lanceolate and stemmed, indented-base Duncan and Hanna types. Frequently, but by no means predominantly, the large, Mallory side-notched point is found in association. Known first from the Northwest Plains where the type site is noted also for large, stone-filled hearths (Mulloy 1954, 1958), Benedict (1981) has proposed a mountain origin based on points he considers transitional between Paleoindian and McKean that may be dated to the Early Archaic period.

The Apex complex defined for Middle-Late Archaic occupations at Magic Mountain is defined by a wide variety of stemmed and side- or corner-notched projectile points (MM 5-MM 23), which have straight, concave, and convex bases and often serrated blades. Types MM 6-MM 17 types are McKean-like. Numerous flaked stone tools are associated, including a predominant side scraper and reduced numbers of end scrapers over the preceding period. Ovoid unifacial and

bifacial scrapers, ovoid choppers and planes, a small pebble chopper, leaf-shaped knives and/or perforators, flaked gravers, and drills with straight to expanding shafts also characterize the complex. Distinctive ground stone artifacts include rocker-type manos (Irwin-Williams and Irwin 1966:192-193).

On the plains, large corner-notched points such as those described for the Early Archaic occupations at the Wilbur Thomas Shelter (Grady 1971) are found in several dated occupations. A similar point, described as a reworked Hawken Side-notched, was recovered at Monaghan Camp (Tucker 1990). Similar points were also found at Dipper Gap and Spring Gulch in Middle Archaic contexts characterized by McKean Complex and Mallory points (Metcalf 1974; Kainer 1976). At the Slay Shelter, a Mount Albion-type point exhibiting blade retouch and moderately ground hafting notches was recovered. The site also produced debitage and numerous tools. The latter included scrapers, drills, gravers, bifaces, knives, utilized and retouched flakes, and ground stone (Brunswig 1992). At the Hutton-Pinkham site, in addition to two probably Archaic points, Larson et al. (1992) recovered several flaked tools, ground stone. The assemblage also included four bifacial cores and two pebble cores.

Dipper Gap is probably the best known Middle Archaic site in northeastern Colorado. Here the dominant diagnostic artifacts were of the McKean complex, although they were found mixed with points comparable to those of the Mountain complex, the majority of which were Hanna. Most of the material was of local Flattop chert. In addition to a large variety of flaked lithic tools, especially projectile points, scrapers, and knives, there were bone implements, beads, and gaming pieces. At 5WL40, in addition to a Hanna point, Wood (1967) found petrified wood debitage, considered unusual in the area. At Wilbur Thomas Shelter, Duncan and Hanna points were found in association with plano-convex, snub-nosed end scrapers, ovoid to triangular scrapers and knives, and spokeshaves (Zimmerman 1971; Loebbers 1971). At 5WL48, a Duncan point was recovered, although most of the material was from Late Archaic occupations (Jepson et al. 1984). At Rock Creek, nine stemmed, indented-base points identified as McKean complex and a drill were found in two occupations. All hafting components from both occupations were ground. Bifaces and modified flakes were common and cores rare. Debitage included Windy Ridge quartzite, Kremmling chert, and Parker petrified wood. There was also an atlatl weight. Radiocarbon age estimates for associated hearths, however, placed the occupation in Early Archaic times (Gleichman and Karhu 1997). Parker petrified wood was predominant at sites 5AH741 and 5AH747 on the plains east of Denver, whereas Bayou Gulch on the edge of the Palmer Divide exhibited a wide variety of materials, including rhyolite, the source of which is the Castle Rock area (Gilmore 1991b).

Late Archaic sites on the plains exhibited the same wide variety of flaked lithic tools as is evident in the Middle Archaic period. Triangular, corner-notched projectile points were found at the Uhl site (Wood 1967). At Happy Hollow, three corner-notched points were found and one that resembled a Besant point (Steege 1967). At Rattlesnake Shelter, a projectile point comparable to those from Van Bibber Creek (Nelson 1969) and to Butler's (1986) Late Archaic Corner-notched Type 3 was found. Minimal amounts of Flattop and Hartville cherts were also recovered at the site (Brunswig 1996). At 5DV3108 on Denver International Airport, a Park point was found; an isolated atlatl weight was also found. The latter is made of magnatite hornblend schist, which is a relatively common material (Tate et al. 1989a). Its nearest source, however, is the Idaho Springs area. At 5AH416, near Parker, Kalasz et al. (1996) noted an abundance of Parker petrified wood,

but few Late Archaic projectile points, metates, or formal flaked tools; the trend was toward expedient flake tools and production of early- and middle-stage bifaces.

In the hogbacks/foothills, Early Archaic occupations are known from several sites. North of Fort Collins, these include Spring Gulch, where types were found that were described as similar to Magic Mountain complex, LoDaisKa complex D, Mountain complex, and Altithermal Side-notched (Kainer 1976). At Phoebe Rockshelter, points similar to Altithermal Side-notched or Hawken were found (Thompson 1986). Mount Albion points are known from surveys in the area, both in the Lykins Valley and on South Rabbit Mountain (Morris et al. 1979; Grant et al. 1996). Mount Albion points were also found at Dancing Pants Shelter (Liestman and Kranzush 1987), and similar artifacts without the characteristic basal grinding were recovered from Cherry Gulch (Nelson 1981). Also west of Denver, the Magic Mountain and Apex complexes described above were defined at Magic Mountain (Irwin-Williams and Irwin 1966). Types MM 3 and MM 4 points are also known from sites in the Two Forks and Roxborough survey areas (Windmiller and Eddy 1975; Tate 1979). At the Crescent site, MM 2 and MM 3 projectile points were recovered (Stone and Mendoza 1994). Nearby, at LoDaisKa, large corner- and side-notched points were found with triangular knives; several types of scrapers, drills, and perforators; bone tools, tubular beads, and gaming pieces; decorative pendants; and other materials (Irwin and Irwin 1959). Similar side-notched points were identified at the Helmer Ranch site in association with ground stone, flaked lithic, and bone tools (Scott 1963).

The Middle Archaic in the northern hogbacks/foothills is characterized by McKean artifacts, in some cases in association with the large side- and corner-notched types of the preceding period, such as at Spring Gulch. Here McKean types and Mallory points were found with a wide array of flaked, bone, and ground stone tools, generally comparable to those at the Dipper Gap site on the plains (Kainer 1976). At Phoebe Rockshelter, a similar tool assemblage, including all of the McKean types, was found, some of which were local Morrison quartzite (Thompson 1986). Pack Rat Shelter produced a similar assemblage of McKean artifacts overlying others tentatively identified as Mountain complex. Lunch Cave and Owl Canyon Rockshelter also produced McKean materials (Morris et al. 1985; Burgess 1981).

Sites in the hogbacks west of Denver contained both McKean-type and MM 3 points in their Middle Archaic occupational levels. At Magic Mountain, the Apex complex contained several projectile points resembling those of McKean, and Complex C at LoDaiska was described as comparable to lower level McKean (Mulloy 1954) with McKean lanceolate and Duncan points, end scrapers, utilized flakes, bone beads, paint stones, and large, stone-filled hearths (Irwin and Irwin 1959; Irwin-Williams and Irwin 1966). At Cherry Gulch, Nelson (1981) identified a point with an indented base that he compared to a type Sorenson V and also to the type MM 6, but without the heavy serration of the latter. He postulated that the point may be an early McKean type. Dancing Pants Shelter yielded points representing those of the McKean sequence (Liestman and Kranzush 1987).

Sites with both McKean artifacts and MM 3 projectile points, often in the same levels, included Bradford House II, Falcon's Nest, and Swallow sites, all on the Ken-Caryl Ranch (Johnson and Lyons 1997a; Adkins 1993; Rathbun 1991; Rathbun and Hammond 1995). At Bradford House II, where all of the points of the McKean sequence, as well as Mallory and MM 3 specimens, were found, a Duncan point was found in association with a slab-lined hearth, a feature typical of Middle Archaic occupation in the area. At the nearby Bradford House III site, no

McKean artifacts are reported. Here, investigators found MM 3 points and a higher proportion of formal tools than retouched or utilized flakes in the Middle Archaic levels, stone-filled hearths, and a storage cist created by placing courses of stone in an arc against the back of the shelter wall (Johnson and Lyons 1997a, 1997b). Middle Archaic occupations at Ken-Caryl Ranch sites are characterized as having fewer features and diagnostic artifacts than are the McKean occupations at sites near Fort Collins. Johnson et al. (1997b) interpreted the Ken-Caryl evidence as reflecting less intensive or less permanent occupations or both, than those to the north.

The Late Archaic period in dated occupations of the eastern foothills north of Fort Collins is known for a group of diagonally notched points with bases that range from concave to convex. At Spring Gulch, these are designated Types 10-12, 16, 18, and 22-24, which are suggested possibly to represent a continuum from the stemmed forms of the Middle Archaic (Kainer 1976).

West of Denver at Magic Mountain, the upper levels of Zone C produced projectile points described as types MM 17 and McKean with medium-sized, side-notched artifacts designated types MM 20 and MM 21, and corner-notched type MM 23 points. In this context also is the base of a massive stone wall considered transitional between Late Archaic and Early Ceramic times (Kalasz and Shields 1997). Large, corner-notched points were found at Willow Creek Shelter and the Van Bibber Creek Site (Leach 1966; Nelson 1969). At the latter site, Types A-C from Zone C were described as having expanding stems with convex unground bases. Gunnerson (1987) later stated that four of the six points were comparable to the type MM 20. Associated with this occupation were two small rock piles, indicative of stone boiling activities. In Zone B, there was a corner-notched point type similar to the type MM 26 (Nelson 1961). At Cherry Gulch, projectile points included some similar to types MM 18, MM 20, and MM 23, and a large, indented-base type that resembles a Duncan point (Nelson 1981). At Dancing Pants Shelter, three large corner-notched points were recovered in Late Archaic levels, as was a disturbed, slab-lined hearth (Liestman and Kranzush 1987).

On the Ken-Caryl Ranch, Late Archaic occupations are evidenced by large, side-notched and corner-notched points, and a Park point at Bradford House II. Unusual in the Late Archaic occupational levels at the site is the presence of rhyolite and a ground stone pestle. At Bradford House III, points are described as diagonally notched, triangular bifaces found in occupations that also contained decorative items, such as a bone pendant and amazonite (Johnson and Lyons 1997b, 1997b). At the Swallow site, Rathbun (1981) described neatly made, basin-shaped, rock-floored hearths for the period. Just east of the Ken-Caryl sites, at the Massey Draw camp and butchering site, the major flaked tools affiliated with the Late Archaic occupation were nonbifacial cobbles and nodules, edge-modified flakes, bifaces, and stemmed bifaces. Types 10-16 are comparable to other Late Archaic corner-notched types, such as Pelican Lake. A Hanna point was also recovered. Debitage consisting mostly of tertiary flakes was mainly quartzite and chert, with lesser amounts of petrified wood, quartz and quartz crystal, and minute amounts of obsidian. Bone awls, a probable bone bead, and ocher were also found (Anderson et al. 1994). At the nearby Dutch Creek site a Late Archaic point was comparable to the type MM 20 corner-notched from Magic Mountain (Jepson and Hand 1994).

In the mountains, Altithermal-type, large, side-notched points were found at the Ptarmigan site, along with triangular bifaces, spokeshaves, a split pebble scraper, and fragmentary corner-notched points. Benedict (1981) argues for a continuum derived from the Mount Albion complex, with less basal grinding, and continuing at hogbacks and Front Range sites through the Late

Archaic period. At Hungry Whistler, 40 Mount Albion points, three stemmed, indented-base points, and one stemmed point with a concave base were found with other artifacts, including milling slab fragments and pigment stones. The flaked lithic materials were of quartzite, chert, chalcedony, petrified wood, and argillite. At nearby site 5BL70, numerous Mount Albion points were found with ground stone, debitage, and a cobble-filled hearth (Benedict and Olson 1978). In North Park, several large, side-notched points have been identified as Mount Albion and Magic Mountain complexes; others are compared to Hawken points (Lischka et al. 1983). The latter two point types have been identified in South Park as well.

Several point types generally considered to mark Middle Archaic occupations have been interpreted as deriving from Early Archaic contexts at sites in the Front Range. Mallory-like points were found in an Early Archaic context at the Albion Boardinghouse site (Benedict 1975a). Points seen as transitional from late Paleoindian to McKean were found at the Fourth of July Valley site, also in a context interpreted there as Early Archaic (Benedict 1981). The artifacts were found in association with bifaces, retouched flakes, utilized prismatic flakes, choppers/scrapers, perforators, a core, and ground stone, as well as debitage, the vast majority of which was Spanish Diggings quartzite. Stemmed, indented-base point fragments of Kremmling chert, similar to both Pinto and Duncan points, were proposed as transitional to Duncan at the Coney Lake Site, which also contained bifaces and flakes. At 5BL96, a primary butchering site, a stemmed, indented-base point was proposed as Early Archaic in age, also supporting a McKean evolution in the mountains (Benedict 1990).

At some sites, Early Archaic artifacts appear to have been reused during subsequent periods. At the Flattop Game Drive, for example, the investigator found more than 50 projectile points or knives of Mount Albion affiliation. The artifacts, of Dakota orthoquartzite, porcellanite, argillite, and silicified wood all had evidence of reuse. In the same context were three stemmed, indented-base points of Kremmling chert, a stemmed, concave-base point of Dakota quartzite, and an Elko Eared point, knives, scrapes, utilized flakes, and debitage of Dakota quartzite and Kremmling chert (Benedict 1996). Middle Archaic occupations are indicated at the Devils Thumb Trail Site, where a Park point was found, and the Berthoud Bridger site, which produced a Mallory point (Kindig 1997a; P. Gleichman 1984). At the Button Rock site, a sample from a slab-lined hearth returned a Middle Archaic radiocarbon age estimate.

Dated Late Archaic occupations in the mountains, as elsewhere, are frequently marked by corner-notched dart points. At the Joe Wright site, Morris and Marcotte (1976a) found the bases of two large, corner-notched points, while the Blue Lake site produced bifaces and a reworked, corner-notched point with expanding stem and an irregular base, similar to those at the Medicine Lodge Creek Site in Wyoming (Benedict 1979b). At the Coney Lake site, two occupations were interpreted as Late Archaic. The older occupation had a few flakes of Table Mountain jasper and Kremmling chert. The younger occupation was characterized by Coney Lake Corner-notched points and miniature utilized flakes. As described, Coney Lake points have elongated stems with convex bases. Benedict (1990) considers them to be ancestral to the Early Ceramic Hogback points found at the site. All of the Coney Creek corner-notched points were manufactured of Kremmling chert. Unlike the sites mentioned above, the probable Late Archaic occupation at site 5PA153 contained fragments of three stemmed and shouldered points with slightly concave bases (Schubert et al. 1981). At Bode's Draw, considered a floral and faunal processing site located near an unidentified camp, a Late Archaic feature described as a slab-lined oven was found with associated flaked lithic tools, ground stone, and bone scraps (Benedict 1993).

Several conclusions can be drawn about the technology of the Archaic stage. It seems apparent that the side- and corner-notched dart points of the Late Archaic period represent a later stage in a continuum that began in the Early Archaic period. Exactly where or how the lanceolate or stemmed points of the Middle Archaic period fit into this continuum is less apparent, as they are morphologically more like points of the Late Paleoindian period and/or Great Basin Archaic. Also, a large variety of formal lithic tool types was observed in Archaic components, often more than in subsequent Early Ceramic period assemblages. However, expedient flake tools are not lacking at these sites, and in some sites, often those in proximity to a tool stone source, they are dominant. Hafted tools frequently evidence reworking and reuse. A variety of bone tools is also present in the larger base camps of the Archaic, and ground stone is abundant. Several types of hearths have been reported, ranging from simple, basin shaped to rock filled to slab lined or rock floored, indicating intensive faunal and floral processing. A few storage pits are also known for the period.

Paleoenvironment

The major paleoclimatic event of the Archaic stage is the Altithermal episode (Antevs 1949, 1955), a phenomenon that is generally acknowledged but still not well understood. The Altithermal correlates generally with the Atlantic subepisodes of Bryson et al. (1970). For the Southern Rockies and adjoining plains, Benedict (1979a) has described the effects of the Altithermal in cultural terms. He gathered totals of radiocarbon dates from acknowledged Altithermal sites across a large area of western North America to derive population curves. Based upon these curves, he argued that rather than a single great drought, there were actually two major altithermal droughts, from 7000-6500 B.P. and 6000-5500 B.P., which were separated by a period of increasing moisture and local mountain glaciation (Benedict and Olson 1978). Actually, Benedict (1979a) proposed three peaks of higher effect moisture, one at 7250 B.P. before the first major drought, the second at 6300 B.P. between the two droughts, and the third at 5200 B.P. following the second drought. The period from 5000-4000 B.P. is not well understood, but by 3300 B.P. cooler climatic conditions occurred, about the time of the Late Triple Lakes glacial advance. Climate during the final centuries of the Archaic is characterized by somewhat higher effective moisture on the plains (Benedict 1981; Butler 1986). Holliday (1987), in analyzing evidence from the erosional and depositional sequence seen at Lubbock Lake, also found evidence for two major droughts on the Southern Plains, although the dates of the two events differ from those postulated for the Rockies.

From the population curves, Benedict proposed the Altithermal Refugium model, postulating that human groups from drought-stricken areas west and east of the Rockies sought refuge in the foothills, using the high country of the Front Range Continental Divide seasonally for communal hunting and gathering (Benedict and Olson 1978). Of special interest, then, is any evidence for Altithermal occupations of the plains of the Platte River Basin in Colorado. Four sites with absolute-dated, Early Archaic occupations are known in the plains subarea. Only two of these sites, Rock Creek and Willow Bunker, have occupations dated to the period of one of the major droughts. The other two, Monaghan Camp and Hutton-Pinkham, were occupied during the subsequent period of higher effective moisture. Rock Creek, which is located along the western edge of the Colorado Piedmont near the foothills, has an occupation dated to 5690 $\pm$ 64 B.P., during the second drought, as well as evidence for an earlier camp at 6240 $\pm$ 190 B.P., during the interval between the two droughts (Gleichman and Karhu 1997). Willow Bunker is located on the Pawnee Grassland at the northern edge of the Colorado Piedmont, and has a buried component. A

sample from a hearth found eroding from a cutbank at the site yielded a radiocarbon age estimate of 6910 ± 50 B.P. (Overturf and Feiler 1998), placing occupation of the site near the beginning of the first drought. As might be expected, both sites are located along drainages, the latter in an area of spring-fed ponds.

Paleodemography

The radiocarbon record for the Platte River Basin area shows a generally increasing number of Archaic sites or occupations through time, in conformance with the expected exponential population curve (Figure 5-2). There are, however, fluctuations, both peaks and valleys and brief periods with no dates. For the Early Archaic period, there are far fewer dates for sites on the plains than for sites in the hogbacks/foothills or mountains. Also, there are fewer absolute dated sites in the mountains than in either the hogbacks/foothills or on the plains during subsequent Middle and Late Archaic times (Figure-5-3). At present, however, the radiocarbon evidence is too meager to draw meaningful conclusions. Several factors may serve to skew the results and mask the reality of the occupational patterns through time, not the least of which are variable preservation, sampling bias, and small sample size, particularly on the plains but also in the mountains. Though sampling bias is a widely acknowledged problem, the role of past erosional and depositional events in destroying or burying sites cannot be underestimated.

Paleodemography can be addressed with burial information. The burial sample for the Archaic stage in the Platte River Basin is extremely small, with only a few burials, most of which are found in campsites within the hogbacks/foothills subarea. Study of a group of burials from the Ken-Caryl Ranch sites indicates generally adequate nutrition (Johnson et al. 1997). Skeletal remains from one of two plains Archaic burials, however, provides evidence for several periods of severe nutritional stress (Wanner and Brunswig 1992).

Cultural Process

The specific theories and models most relevant to Archaic occupation in the Platte River Basin of Colorado are those raised in the introductory remarks to this chapter: the Mountain refugium, grand circuit, and Mountain tradition. Unlike the preceding and succeeding stages where the emphasis is on the study of the plains subarea, all of these theories pertain to mountain-based or -oriented settlement patterns and subsistence practices. Whether this is due to the import of the Altithermal, the fact that the eastern hogbacks/foothills and also the Continental Divide region of the Front Range have long served as research magnets, or to the general and widespread lack of survey of the plains of northeastern Colorado is not known, but all three are likely factors in the emphasis on the mountains during the Archaic. (Models from the Northwestern Plains, e.g., that of Bender and Wright [1988] which involves mountain use by plains peoples, could also be tested and criteria for the plains Archaic, such as those found in [Frison 1991a] and Butler [1986] that could be further studied.)

The Mountain Refugium theory posits that human populations fleeing drought-stricken lowlands sought refuge in the cooler and moister Rockies during Altithermal times. It argues that people based in the hogbacks/foothills to the east traveled seasonally to the high country of the Continental Divide for communal hunts at game drive sites and for plant gathering. In support of this theory, more radiocarbon-dated Early Archaic occupations are recorded in the mountains than on the plains and more than in Middle Archaic occupations in the mountains. However, the

entire sample is very small. Access to the high country was via the simple expedience of up down or piston engine movement. The demonstration of this pattern of movement rests largely on the observation that sites of the Altithermal Mount Albion complex contain lithic tools and debitage, as well as ground stone, from sources in the hogbacks/foothills region (Benedict and Olson 1978; Benedict 1979a).

The grand circuit model, though actually a seasonal rounds/transhumance mechanistic device comparable to the movement of a rotary engine, carries the assumption that people throughout the Archaic, as well as the subsequent Late Prehistoric stage, were based in the eastern hogbacks/foothills of the Front Range and used the mountains seasonally. This model posits an extended round heading north along the eastern base of the Front Range in spring, across into North Park, south into Middle Park and east to the Continental Divide for communal hunting at numerous game drives before returning to the hogbacks in late fall. Like the piston engine model, the evidence for this pattern comes largely from the observations about lithic materials found at sites. At sites such as Coney Lake, Benedict (1990) notes the presence of Lyons Sandstone metates and flaked lithic artifacts of Kremmling chert and other materials from Middle Park. The sandstone is believed to have been carried from the hogbacks area along the route of the annual round and abandoned at the Continental Divide sites as people were heading back to their winter bases in the hogbacks, where such material is abundant. The Middle Park flaked lithic materials are interpreted as reflecting a renewal of the tool kit after having exhausted tools of hogback materials (Benedict 1990).

The Mountain tradition is considered an adaptation distinct from that seen on the plains as early as the late Paleoindian-Early Archaic transition and continuing until Numic sites appear late in the prehistoric era. The adaptation is characterized by winter habitations found in mountain valleys, as well as by short-term dwelling structures, projectile points resembling those to the west, and a distinctive, split-cobble tool technology and microtools, including a distinctive scraper (Black 1991). Metcalf and Black (1997) have proposed a transhumance model of annual rounds, with site types that fall along the forager-collector continuum (see Binford 1980) to show seasonal movements of groups from winter base camps in mountain valleys up to the higher country of the Continental Divide for hunting and gathering. Black (1997a) earlier provided examples of hypothetical annual ranges for the mountain Archaic, which are also not inconsistent with those of Benedict.

Several questions are raised by these models. One is mountain-oriented versus mountain-based adaptations. This perceived difference may be merely a matter of definitions. If the hogbacks/foothills are defined as transitional to the mountains, as used in this context, then groups based in the hogbacks are mountain oriented. If, however, the hogbacks/foothills are defined as part of the mountains as a whole, then these groups are mountain based, just as are groups based in mountain valleys. A second question pertains to the inclusivity/exclusivity of the various models. These models are intended merely to explain perceived cultural patterns based on observation. They are not mutually exclusive, containing overlapping elements (as when they include all or parts of the same archaeological complexes), and neither Benedict nor Black claims to describe the total variability that exists in the Archaic record. Obviously, more work is needed to better understand the regional settlement and subsistence of the Colorado mountains and the relationships of groups who used the high country. Researchers will need to test the utility of the various models to see which best fits their data, as did Cassells (1997:220) in his study of "the role of a Front Range game drive in regional settlement and subsistence systems." Some may choose to

formulate new models as well. Black (1997a) offers suggestions for useful avenues to pursue to test the model of the Mountain tradition.

Research Questions and Data Needs

One purpose of the present context is to examine the research problems posed by Eighmy (1984) and Guthrie et al. (1984) in light of the accumulation of data in the intervening 15 years or more since the original contexts were compiled. Other goals were to pose additional research questions and to update the 1984 list of data needs.

Plains

Eighmy (1984:63-64) lists nine research problems, which are reproduced below. Following each problem is a discussion, including new information relevant to the problem. When applicable, discussion of hogbacks/foothills is incorporated.

- The relationship between the Archaic and the Paleoindian stage on the one hand and the Ceramic (Late Prehistoric) stage on the other.

The relationship between the Archaic and Paleoindian stages can be expressed as a part of a general hunter-gatherer continuum that persists until the advent of village life and horticulture on the plains. The emphasis changed from one of big game hunting to a more generalized subsistence economy in the Archaic, which is reflected in tool kits and features adapted to hunting a broader variety of game and extensive plant processing activities, but the basic pattern remained. In the mountains, where a broader based subsistence economy was the strategy even in Paleoindian times, its persistence into the Archaic is relatively uneventful. Frison ( ) postulated two economic adaptations by the end of the Paleoindian period, bison hunting on the plains and smaller game hunting and gathering in the foothills and mountains. The Mountain tradition proposed by Black (1991) also proposes a continuity of culture and adaptation from the late Paleoindian stage into Late Prehistoric times. Unfortunately, sites with evidence for both Paleoindian and Archaic occupations are not common. Such evidence exists at sites such as Lindenmeier and Lamb Spring, but the younger occupations have not been intensively studied. Two sites in the high country of the Front Range were occupied during the early Altithermal. These sites, Albion Boardinghouse and Fourth of July Valley contained projectile points that Benedict (1975a, 1979a, 1981) considered transitional between late Paleoindian and Archaic, but more such sites are needed to verify the interpretations.

At the other end of the continuum, numerous absolute-dated multicomponent campsites, contain evidence for both Late Archaic and Early Ceramic occupations, particularly in the hogbacks/foothills subarea but also on the plains and in the mountains. The conclusions of investigators at these sites is remarkably uniform. New traits, such as the hallmark bow-and-arrow technology and pottery were introduced. Also, trend toward less formal tool types and use of more expedient flake tools was seen. Burial practices also became more complex, in terms of accompaniments. Nevertheless, in terms of overall culture, continuity in settlement and subsistence practices from the Archaic to Late Prehistoric stages is reported repeatedly in the literature for the last several decades (e.g., Wood 1967; Tucker et al. 1992)

- Typological study of projectile point styles and investigation of the cultural significance of styles such as the McKean and Mountain Side-Notched.

Classification systems for projectile points have been offered since the last context was published (Butler 1986; Anderson 1989). Various investigators (e.g., Brunswig 1996; Kalasz and Shields 1997) have found these useful and adopted one or the other for their studies. Benedict (1990) found that stemmed, indented-base points at the Coney Lake Site proposed as transitional to Duncan and another in an Early Archaic context at site 5BLK96 support his argument of a mountain origin for the McKean complex (Benedict 1990). Gleichman and Karhu (1997) found McKean materials at the Rock Creek site, also in an early context, which lend support to the hypothesis. Otherwise, no new local studies have addressed the cultural significance of the Mountain Side-notched or McKean styles.

- Paleoclimate and the Altithermal. Was there an occupational hiatus along the South Platte and continuity in the mountains/foothills ?

Several arguments support the occurrence of a climatic episode with significant effects on the environment and human populations on the plains. Benedict's studies led him to posit a two-drought Altithermal with a subsequent hiatus of drought-stricken regions (Benedict and Olson 1978; Benedict 1981). For the Platte River Basin, he proposed that people on the drought-stricken plains sought refuge in the hogbacks and foothills of the Front Range and used the high-altitude areas seasonally. The archaeological record and other sources appear to indicate that at least very reduced populations of bison and people were on the plains during the Altithermal, but that sites, such as Rock Creek and Willow Bunker, do exist. The age estimates for these sites, however, are very near the dates for the two major droughts and may indicate that some revision of the Altithermal drought dates is warranted. Also, the possible effects of the grossly inadequate archaeological sampling of the plains has to be considered, as does the potential incidence of site burial and destruction of sites through erosion that has occurred periodically since the Altithermal.

- Possible evidence for population movements and/or increases in regionalism.

Radiocarbon data from sites in the Platte River Basin appear to indicate movement of people into the mountains during the Early Archaic and onto the plains in the Middle Archaic. However, this view is complicated by both sampling bias and overall increasing frequencies of dates through time. The variety of lithic materials described from sites in the Platte River Basin indicates probable movement of people between the hogbacks and South Park, the hogbacks and plains to and from Middle Park, and between the plains and mountains of Colorado and Wyoming.

- Possible influences from outside the Colorado Plains area such as the Southwest.

Early reports, especially those of the 1950s and 1960s but also some more recent (Irwin and Irwin 1959; Irwin-Williams and Irwin 1966; Nelson 1981) attributed projectile points and other artifacts from Archaic occupations at sites to influence from the Great Basin. Likewise, broad-based cultural manifestations, such as the McKean complex and Mountain tradition have been theorized to have their origins in the Great Basin, based on similarities of projectile points and other traits (Mulloy 1954, 1958; Black 1991). An obvious, probably Southwestern influence is seen in the introduction of maize into sites in the Platte River Basin. The Chapolote-type *Zea mays*, which was found at LoDaiska, likely had either its trait or actual physical origins in the

Southwest, despite the ambiguous age of its associated context at the site (Irwin and Irwin 1959; 1961).

- Lithic source identification and distribution.

Strides have been made in the last 25 years in lithic source identification and distribution. On the plains, archaeologists have identified Flattop chert from the extreme northeastern corner of the state, Hartville chert from Wyoming (Brunswig 1996), and numerous other local materials, such as the common Dawson Formation (Parker) petrified or silicified wood of the Palmer Divide and surrounding environs, the common Dakota Formation quartzite of the hogbacks, rhyolite from the Castle Rock area, and others. Also on the plains just east of the foothills, Kremmling chert, Windy Ridge quartzite, and Table Mountain and Trout Creek jasper were identified (Gleichman et al. 1995). Kremmling chert and Table Mountain jasper have been known for some time in Middle and North park sites, and in the Continental Divide area of the Front Range. In hogback sites, Trout Creek jasper from South Park has been identified, as has Flattop chert from northeastern Colorado, and minute amounts of obsidian, one piece sourced to New Mexico (e.g., Johnson et al. 1997b). In addition to the relatively local sources from the mountains, Benedict (1975a) found artifacts of Spanish Diggings quartzite. Surface inventories in North Park have also identified lithic materials from Wyoming, such as Tiger chert (Harrison and Tate 1997).

- Subsistence and seasonality.

To summarize the existing information, subsistence in the Archaic periods was generally dominated by deer and bison, but other large and medium game species, such as elk, bighorn sheep, and pronghorn also played an important role in the subsistence strategy of Archaic people. In terms of both numbers of individuals represented in sites and their simple frequency of presence, the importance of rabbits cannot be overstated. Numerous other small mammals and occasional birds and freshwater snails appear in documentation of sites. There is evidence also for a variety of plant foods, which include seeds of numerous species, nuts, berries, starchy roots, and cactus parts. A broad variety of flaked lithic and ground stone tools, as well as several bone tool types, is present at sites in the region. There are several types of hearths and roasting pits, and evidence for stone boiling also occur. Frequently, the bone is intensively processed for marrow and/or grease manufacture. There is also evidence in a few instances, of storage pits in base camps.

The evidence for seasonality on the plains is not significantly different from the preceding Paleoindian period, where bison kills most often occurred in late fall or early winter. At the Merino site, the only known Archaic bison kill site known to date in the plains subarea, the event likely also occurred in late fall or early winter (Morris and Marcotte 1975). In the hogbacks/foothills, however, evidence from the Massey Draw butchering site, where bison was also the dominant animal involved, the evidence is for late spring kills somewhere nearby (Anderson et al. 1994). In the mountains, at numerous game drives and associated butchering sites and/or camps, communal hunts in late summer or early fall are indicated (e.g., Benedict and Olson 1978; Benedict 1990, 1996, 1998).

- Site settlement studies similar to Kvamme's.

Kvamme's (1979) settlement study was useful in confirming that presence of sites is correlated with distance to water and with certain elevational landforms. He analyzed settlement variability in 2,560 ha (6,400) acres of the Narrows project area on the plains in northeastern Colorado. Using data from a stratified but nonrandom sample, he discerned four general patterns of camp locations: drainage mouths on flat terraces where small tributaries join the South Platte River; low terraces on the valley floor; high terraces typically on the south end of ridges that form divides between tributaries; and, sand hills on the crests of stabilized dunes (Kvamme 1979:21).

A similar study by Tucker and Bahe (1995) analyzed the data from documented sites on the plains in the Aurora vicinity east of Denver and formulated a site locational predictive model. They concluded that distance to water, slope, and aspect were the best determinants of site location. The model was later tested against the results of a 2,000 ha (5,000 acre) inventory. As a result, Phillips and Bambrey (1997) argued that the only environmental factor that demonstrates a dependable correlation with site location in the area was proximity to water.

A survey in the foothills near Loveland resulted in the finding of a preference for camps and architectural habitations located in open areas on east-sloping shelves providing good views of the mountains and protection from prevailing west winds. These sites were in open, relatively flat areas usually in the mountain mahogany or mountain mahogany-ponderosa pine communities.

Grant et al. (1996) used a model to explain the relationship between prehistoric site locations and environmental variables in the foothills of Boulder County. After studying site data, investigators concluded that slope was the most significant predictor of site presence in areas with adequate relief to allow sufficient variance. Second in importance was landform; the highest values were for lowland terraces and ridge slopes, followed by upland terraces, ridge crests, and saddles. They explained the perceived weak link that appeared between site location and nearness to water in part because no location with the study area was more than 300 m from water.

A large survey covering portions of the mountains, foothills, and hogbacks of the Front Range was conducted for the proposed Two Forks project in the 1970s. Windmiller and Eddy (1995) found that greatest concentration of sites where the South Platte Canyon forms a broad valley. Sites here were found clustered along terraces and pediments and along some of the permanent creeks flowing into the South Platte. The next highest density was found in uplands on terraces adjacent to permanent creeks and in mountain meadows. Along the hogbacks, sites were grouped around seasonal springs and creeks flowing out of the hogback valleys.

Within the hogbacks specifically, sheltered camps are found primarily in overhangs of Fountain Formation sandstone, primarily facing southwestward. Open camps are found in saddles in the valley between the Fountain Formation and the Lyons hogback and on the south slopes of the latter landform at water gaps, as is the case with Magic Mountain and the Window Rock site. Open camps, with and without architecture (none known of Archaic origin) are also less commonly found on the crest of the Dakota hogback, where chipping stations and quarries are the dominant site types (Tate 1979).

In analyzing high-elevation site locational data, Benedict (1992) found that the vast majority of known game drive systems in the area are located along the Front Range crest on

ramps or benches, on narrow ridges extending eastward from grazing areas, on passes, and on floors of cols that connect the heads of Eastern Slope valleys. Open camps found in the vicinities of the game drives are often in relatively sheltered locations, such as valley floors (Benedict 1992).

- Formation processes of Archaic sites, the rate of site destruction, and nature of site transformation.

Since 1984, several sites with Archaic occupations have been investigated. The research of James Benedict in the Front Range mountains has long included painstaking analysis of geological processes of site formation and destruction, and geomorphological studies have been increasingly emphasized at sites in the plains and hogbacks/foothills subareas (e.g., Gilmore 1989b, 1991b; Kalasz et al. 1996; and Kalasz and Shields 1997). A study of note, discussed earlier in the paleoenvironmental subsection of the chapter Environment is the geoarchaeological analysis of South Platte River terraces near Kersey. Using soil sediment records and radiometric dating, investigators here developed environmental histories for the Kersey, Kuner, and Hardin terraces and from this information evaluated their archaeological potential. Pertinent to the Archaic periods, they found that although the Kuner strath incision began earlier than 9600 B.P., its greatest potential is for cultural components postdating 7250 B.P. and that the Hardin fill may yield cultural components dating to the Kuner abandonment, ca. 6380 B.P. Of importance to the preceding stage is the finding that Paleoindian sites on the Kersey terrace are probably not as abundant as some researchers have proposed (McFaul et al. 1994:345-371; see also McFaul et al. 1991).

Mountains

Guthrie et al. (1984:37-38) lists five research problems, enumerated below. Again, each problem is discussed in light of information acquired since 1984. Information on the hogbacks/foothills zone is included when relevant.

- Whether there exists an indigenous mountain-oriented culture (e.g., Mount Albion), and/ or whether the area was occupied seasonally by groups from other areas (e.g., the Plains, Great Basin, Southwest).

Benedict and Olson (1978) and Benedict (1979a) present an argument for the mountain-oriented Mount Albion complex as representative of people who fled the drought-stricken lowlands, established winter bases in the hogbacks/foothills, and seasonally used the high country of the Front Range for communal hunting and plant gathering. Benedict (1990) also proposes that later groups, such as those that seasonally inhabited the Coney Lake area, were also based in the hogbacks/foothills to the east. Black (1991) argues for the year-round mountain-based indigenous Mountain tradition, a cultural adaptation, possibly with roots in the Great Basin, that persisted from the late Paleoindian Plano period into Late Prehistoric times.

- The problem of shallow sites and the mixing effects of solifluction, frost-heaving, and bioturbation and the problems of making sense of even the rare stratified sites under these conditions.

Within the Platte River Basin, the problems of shallow sites, mixing, and poor separation in stratified sites in the mountains have been largely tackled by James Benedict, with the help of

several colleagues, whose expertise in both geology and archaeology and research interests in sites in the Front Range high country makes him aptly suited to the work. This work has continued unabated since the original Mountain context was written (Guthrie et al. 1994). See Benedict (1981, 1985b, and 1990) for a few examples.

- The effects, if any, that the Altithermal might have had on populations in the Mountains region. Was there an influx of peoples from different areas of western North America into the Mountains?

An influx of people from different areas of western North American into the mountains has not been widely demonstrated, but is definitely possible. In the Platte River Basin, the Mount Albion complex, with tools made of materials from the eastern foothills of the Front Range, has been interpreted as representative of that phenomenon (Benedict and Olson 1978; Benedict 1979a). The frequencies of absolute-dated sites and components for the study area support that contention. Frequencies of radiocarbon dates for the mountains and hogbacks/foothills individually are higher than for the plains. The standard caveat of sampling bias has validity. However, frequencies of dates for both the hogbacks/foothills and plains subareas are higher than those in the mountains for the Middle Archaic.

- Variables relating to the strategies employed by the people in the Mountains region which resulted in such a stable and consistent adaptation. How does this consistent Archaic adaptive strategy compare to earlier and later periods?

Settlement and subsistence practices, including use of seasonal rounds and transhumance along a flexible forager-collector continuum, cultural adaptations involving use of architecture and rockshelters for winter habitations, and food storage techniques are characteristic of mountain occupation. Such strategies proved to be stable and consistent adaptations. This pattern, which began in Paleoindian times, persisted through the Archaic periods and into the succeeding Late Prehistoric stage.

- Problems involving seasonal occupation of the mountains.

Problems involving seasonal occupation of the mountains include finding evidence of seasonal use and providing models for the transhumance patterns. Benedict has offered two models. The simple up down or piston engine model to explains the movement of Altithermal peoples from winter bases in the hogbacks/foothills up to the mountains for communal hunting in late summer. The grand circuit or rotary engine model describes hypothesized movements of peoples in the latter Early Archaic and subsequent periods through their seasonal rounds from the eastern foothills northward and across the mountains into North Park and on to Middle Park before ascending the Front Range from the west, also for communal hunting, before returning to their winter bases. Both systems are based largely on flaked lithic materials found at the high-altitude game drives and associated camps. For the former model, materials are largely those found in the eastern hogbacks/foothills, such as Dakota quartzite; for the latter model, the sites include

materials from Middle Park, such as Kremmling chert, as well as ground stone implements from the eastern foothills (Benedict and Olson 1978; Benedict 1979a, 1990).

Additional Research Problems

The research problems posed by Eighmy and Guthrie et al. In 1984 continue to be relevant. Though some progress has been made in answering them, in most instances, researchers attempting to address them with only limited data. Topics such as the role of the Altithermal climatic episode in altering settlement patterns and the origin of the McKean Complex, for example will continue as research questions of importance. The following problems are in need of further study.

- Refinement of the Archaic chronology in the Platte River basin.
- Nature and relative frequency of occupation on the plains in the Early Archaic.
- Validity of the Mountain tradition.
- Validity of various transhumance models, such as the piston engine and rotary engine models proposed for the Front Range, and others, as well. Ranges of seasonal rounds and transhumance patterns, particularly on the plains.
- Validity of Butler's (1986) proposed taxonomy for the Archaic stage.
- Seasonality of site occupations and kill/butchering events.
- Use of mountain parks in seasonal rounds.
- Nature and prevalence of residential architecture and storage features.
- Locations of tool stone sources and sourcing lithic materials at sites. Evidence for long-distance travel or exchange and influence from adjoining areas.

Data Needs

The data needs are numerous. Some of those that would greatly assist in interpreting the Archaic stage and its periods include the following:

- More survey, especially on the plains and in the mountain parks.
- More single component sites.
- More multicomponent sites with stratigraphic separation.
- Sites with dateable Archaic components/occupations.
- Archaic sites with residential architecture.
- Dated stone circle sites.

- Standardized artifact descriptions and metric data, high quality illustrations.
- Comprehensive analysis and descriptions of faunal and floral collections from sites.
- Continued emphasis on geomorphologic studies at sites and a focus on systematic geomorphology applications, such as those of Mandel (1992) in Kansas and McFaul et al. (1994) on the South Platte River terraces in Colorado, to discern regional patterns of erosion and deposition that may have obliterated or covered Archaic sites.
- Multi-disciplinary studies to produce refined reconstructions of paleoclimate, particularly for the Early Archaic period.